the OIL AND GAS JOURNAL

APRIL 15, 1957

3 SPECIALIZED REFINERIES = 1 INTEGRATED REFINERY

High level of economy, product quality, flexibility, and product diversification insure merger's success.

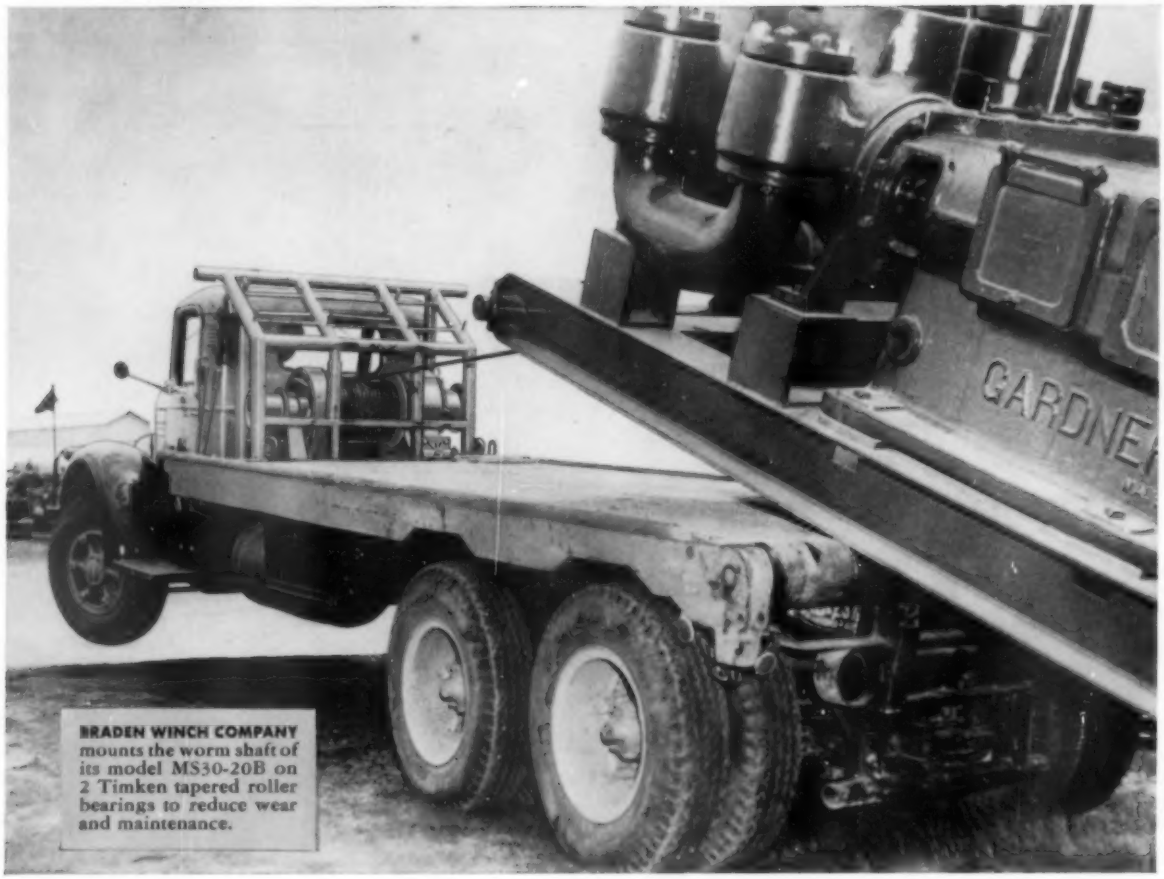
See page 104

New Natural-Gas Bill Introduced

Measure would outlaw utility type regulation p. 81

Oil-Hungry France Looks Toward Sahara

Possible new petrol[illegible] gets political priority p. [illegible]



BRADEN WINCH COMPANY mounts the worm shaft of its model MS30-20B on 2 Timken tapered roller bearings to reduce wear and maintenance.

Truck rears back on haunches—but with TIMKEN® bearings winch takes load in stride

THE Braden winch above has a capacity of 30 tons—a gear ratio of 39 to 1. To meet the formidable loads placed upon heavy-duty winches such as this model MS30-20B, Braden mounts worm shafts on Timken® tapered roller bearings. The special tapered design of Timken bearings enables them to shrug off sustained heavy thrust as well as radial loads from the worm—keeps worm and worm gear accurately meshed for minimum friction, minimum wear.

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JOURNAL News Letter

April 15, 1957
Tulsa, Oklahoma

The next 90 days will be most critical for oil:

That's the private estimate of some well-known oil men with close contacts in Washington and the Middle East. They say the imports question is heading toward a crisis and it must be settled soon for the good of the industry.

Informed circles in Washington are saying new mobilization boss Gordon Gray last week told the cabinet fuels committee an excess of oil imports is threatened within the next 6 months. Gray is keeping secret the actual volume programmed by the importing oil companies and reported to him. But a tip-off they'll be big is this: Gray warned that imports will be well above the proper level based on the cabinet committee's previous formula.

Whether the committee will stick to its formula, retain voluntary controls, or recommend that the President take drastic action is still undecided. Gray also has given little indication of his own position on the issues.

Industry managers charged with planning domestic company programs must have a decision soon. Volume of imports affects their plans for drilling, producing, expanding pipelines, and building refineries. For example: One big company planning a new refinery for the East Coast is holding back until it knows whether economics will dictate charging foreign or domestic crude. Mid-Continent producers also are worried by this talk: A crude pipeline some day will bring Middle East crude from Philadelphia tanker terminals to the Ohio Valley. The St. Lawrence watersay will allow Middle East crude to move into the Great Lakes refining area. There it will compete on the home grounds of Canadian and Mid-Continent crude.

New version of the Harris bill now before Congress is based on this reasoning: Regulation of gas prices now seems to be an established national policy. So it's essential that a workable plan for regulation be adopted (P. 81).

The proposal, as a result, does not aim to free independent gas producers from FPC price control as did the 1955 bill. It merely sets up methods and a formula by which FPC can pass on producers' sales contracts. It also: Wipes out use of public-utility type of price fixing by FPC...And states producers shall be given the fair-field price. Measure does not yet have formal blessing from the White House and it's sure to receive a mixed reaction from the gas industry. Big question, though: Is there time left to get the bill through both houses?

The oil industry got a vote of confidence last week for its work in the oil lift. Report from House Commerce Committee probe hailed the job as a stupendous achievement. Only criticism was oil industry's timing on crude-price increase. Touching on danger of foreign oil-supply lines being cut again, the committee suggested: Better transport facilities... Minimum safe level of crude and product stocks... Greater emphasis on developing Western Hemisphere supplies... More attention to developing liquid fuels from shale and coal as alternate sources.

The mild, constructive report is expected to take some of the sting from blasts due to come from joint subcommittee probe headed by O'Mahoney.

Other Washington notes: Insiders now are saying the chances appear dim for the Kefauver Bill. It would overturn the Supreme Court's good-faith decision allowing seller to cut prices to selected customers to meet competition. Opposition to bill is strong. It will be several weeks yet before proposal emerges from various committees--if it ever does... A quick decision in closely watched Louisiana boundary dispute now before Supreme Court would favor the Government. The court has three courses: Settle issue quickly by granting Government's motion for immediate decision; grant Louisiana right to present depositions supporting its claim; or send case to federal district court for full trial as urged by Louisiana. The offshore fortunes of Texas and Florida also are riding on the final outcome... Drilling for oil and gas on rights-of-way granted western railroads has been banned by court in Union Pacific case. Railroads say this won't upset many plans nor affect their mineral rights to big land grants. But it may restrict their use of rights-of-way to railroading. In that event Southern Pacific's products pipeline along its right-of-way from El Paso through Phoenix to Los Angeles may be open to court attack by truckers.

Of interest to REFINERS, Sinclair has two aims behind its new radiation center at Harvey, Ill., the hottest industrial lab in the country. They are: Find out the value of atomic refining and learn everything about petroleum fractions and what happens to them in use. Sinclair has set several firsts in the lab and is taking an entirely new approach to many aspects of radiation research.

Refiners are finding the third-grade gasolines aren't moving as fast as some had hoped. After first flush of curiosity wore off, sales dropped below anticipated levels in some areas. The high-powered and high cost gasolines on the average only account for 5 to 7 per cent of total sales. This has resulted in shaving tank-wagon prices on the superpremiums and stepped-up advertising campaigns. Sales departments also hope influx of newer cars will help lagging sales.

The O.C.A.W. union finally has cracked Esso Standard's Bayway refinery. Members of Independent Petroleum Workers have voted 1,105 to 969 to affiliate with the C.I.O. organization. Heretofore Esso refinery workers have been represented by independent groups.

There's an interesting story for independent refiners in how Leonard Refineries is making out under its unusual merger plan. Leonard, Mid-West, and Roosevelt, all with small modern plants in Central Michigan, merged late in 1955 under the Leonard name. The move integrated the plants into one

better refinery. The amazing result has been: Better product quality from a variety of processes, flexibility to adjust product yields to meet demand, and more efficient operation since units are kept at capacity on feed stocks better suited to their operation (P. 104).

Canadian EXPLORATION men think two promising wildcats in west central Alberta may rival Red Earth in importance. They are 25 miles apart and 120 miles northwest of Edmonton. Both are prospective producers in the previously non-productive Slave Point section of the Middle Devonian. Successful drilling team on the wells include Home Oil, United Oils, Alminez and Ceoil. Offset wells to evaluate the finds have been held up by the spring thaw (P. 208).

Oil-hungry France is wasting no time exploiting to the hilt the recent discoveries in the Sahara region of Algeria. Here are the developments; Paris approved multimillion dollar programs for pipelines and further drilling. French bankers formed syndicate to back Sahara development. Three companies already in Sahara stepped up efforts. A railroad is underway to meet the initial small-diameter pipeline planned from both Hassi Messaoud and Edjele fields.

There's disappointing and good news from Cuba. Cuban Kewanee has pulled out of its farmout deal with United Cuban Oil in the Jones field in Havana province but will continue its other Cuban operations... Pan American Petroleum is extending its commitments in Cuba from 5 to 7-1/2 years. This will mean an added investment of $5 million on the island.

Richfield won its race with the Alaska thaw and spudded its first test on Kenai Peninsula. Location is on a 71,600 acre Swanson River unit.

First wildcat ever drilled in Vermont is making hole 3 miles west of St. Albans in Lake Champlain country of extreme northwest Vermont. Several factors sparked the drilling campaign: Success of operators just a few miles north in Canada, oil seeps which have plagued farmers for years and forced them to burn off their water wells.

The Loudon waterflood in South Central Illinois is turning up new PRODUCTION techniques which may go a long way toward improving secondary-recovery methods for other areas. After 7 years the 12,800-acre project is giving Carter Oil and other interested operators a double payoff: Production is rising at rate of 1,000 bbl. daily each month. It has doubled to 32,000 bbl. per day in last 3 years... New production methods also are saving money for operators throughout the pool.

Here's what Humble did when its production at Means field in Andrews County, Texas, outgrew tank-battery facilities: Instead of installing more storage and making more pipeline runs, Humble decided on a cheaper plan. It converted the old batteries into transfer stations and installed one central battery with automatic controls. The result was extra oil-handling capacity with least investment, best control of operations, and a 65 per cent reduction in pipeline runs (P. 108).

Offshore DRILLING operators can expect tighter controls by the Coast Guard to insure safety of personnel. The Coast Guard was said to be planning gradual clampdown even before the collapse of the big drilling platform "Mr. Gus." Insurance firms also are reported planning to penalize drilling

vessels whose designs do not meet highest safety standards. This may mean wider variance in insurance rates for different types of equipment.

In past some operators have fretted at annoying standards set by the American Bureau of Shipping and the Coast Guard. But because of widespread damage caused by mild storms in the gulf, offshore firms are becoming more safety conscious. With another hurricane season near, they know they're not ready for a major storm.

Shell is planning to give the Four Corners area a big drilling play this year. Company has announced a 100-well drilling program for the Paradox and San Juan basins for 1957.

Researchers constantly are working on new drilling ideas and equipment. Here's a report on some of the latest:

...A new type drilling-mud testing machine which continuously records weight, viscosity, jel strength, and temperature, may be available soon. California field tests of the prototype model showed the recorded data to be accurate and reliable. Trends and cycles in mud properties not readily apparent from periodic checks were revealed by the continuous records.

...The old drill-stem test is being given some new jobs. If you know how, you can make the tests yield data on reservoir pressure, well-bore damage, and average permeability. Techniques of evaluating this information are given in first of a four-part series on page 122.

...Formation fracturing with sound waves is being tested in the field by a major well-servicing company. Called Sonafrac, process still is under wraps. But this much is known: It requires no sand and works best in heavy crude.

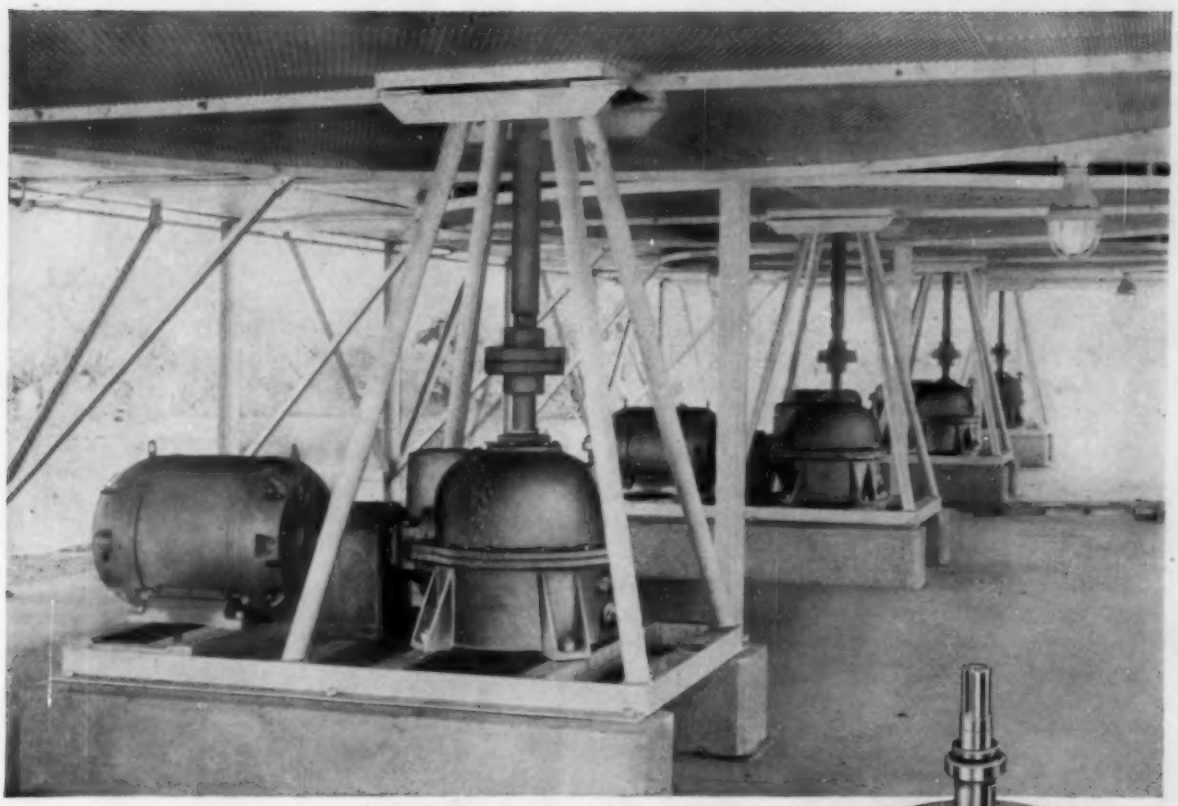
...Dresser's technical talent has been thrown into an all-out search for a bit to go with its turbodrill. They expect to come up with one soon. Need for better bit was demonstrated in recent West Texas tests. Turbodrill speed was impressive, but footage per bit with the turbodrill was less than with rotary.

The Texas Railroad Commission now is investigating what ties PIPELINES and crude purchasers have with trucking firms. The commission broadened its pipeline inquiry last week by calling for sworn statements on their trucking interests from common carriers and purchasers.

There's much speculation surrounding Ray Fish's resignation as board chairman of Pacific Northwest, now merged with El Paso Natural. Fish explains the move was proper to give present management a free hand. But the talk is that Fish, now the biggest single stockholder in El Paso Natural, eventually will move to get control.

Another major crude pipeline from Western Canada to tidewater is being talked. It would extend from the Fort St. John-Boundary Lake area of northeastern British Columbia to Bella Coola, B.C., some 400 miles to the southwest.

Great Northern Railway has taken another step in its studies of a possible pipeline from eastern Montana to move Williston basin crude to the St. Paul-Minneapolis and Duluth-Superior areas. Company has retained Pipe Line Technologists, Houston, to make feasibility survey. Basin now is served by Butte and Service lines.



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Drilling-Production

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By Ed McGhee

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By Larry Resen

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The first in a series on the qualities of good leadership. Functions of leadership, performance requirements, and correct approach are covered in this management foldout report.

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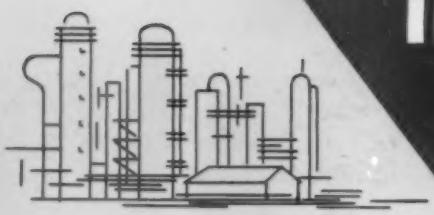

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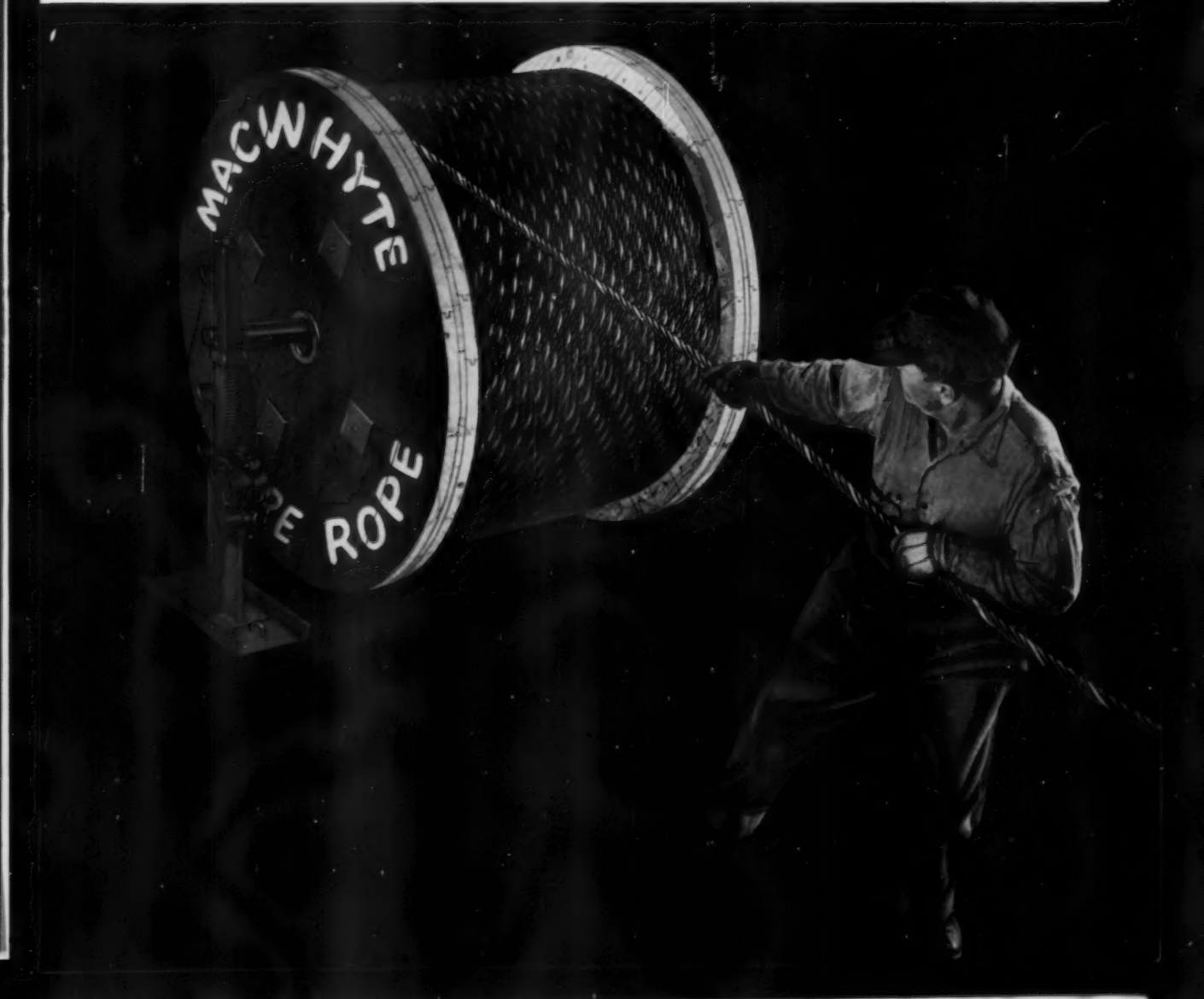

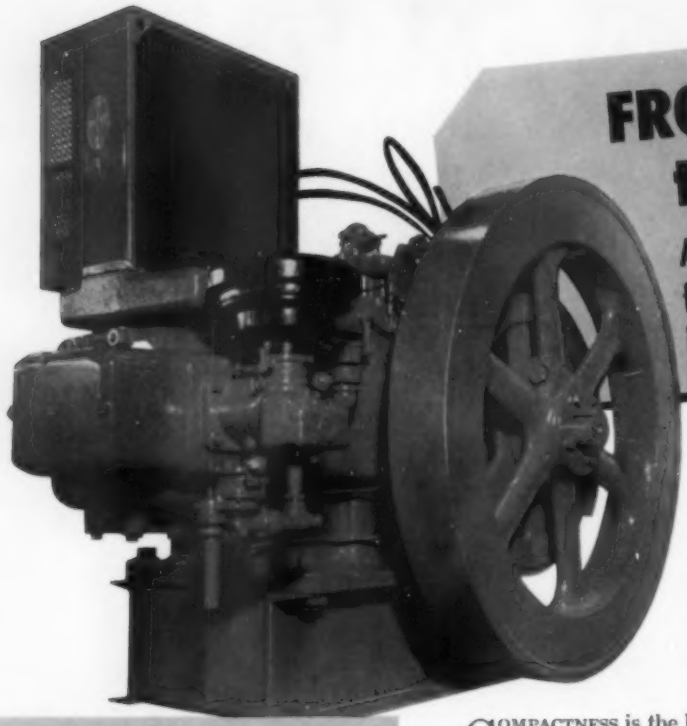

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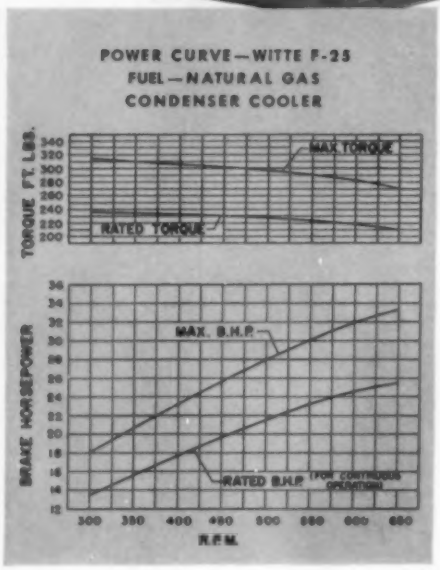

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Nuclear Energy Applications

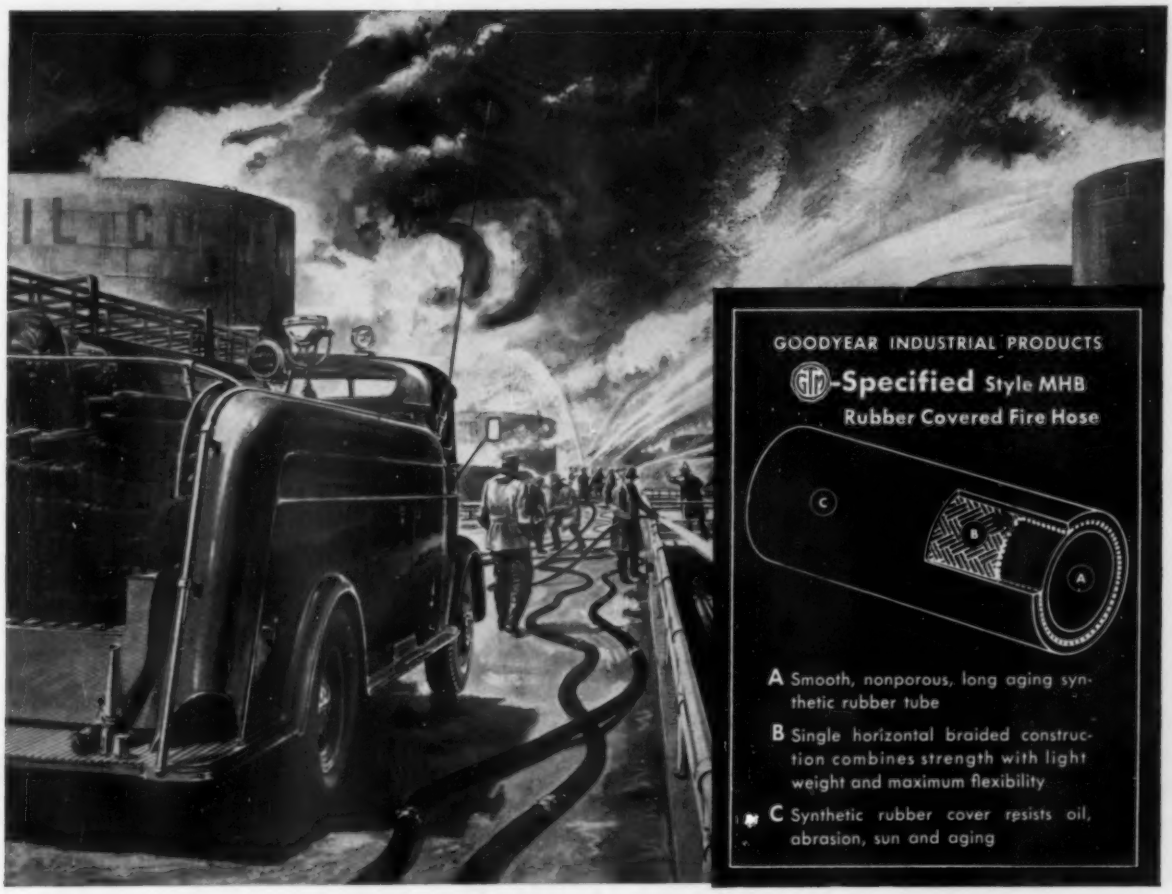
Recent scientific and engineering advances have multiplied the needs for valves and controls with critical operating characteristics.

AiResearch has fifteen years of experience in the engineering and fabrication of specialized valves of all types. We can solve problems which include the handling of liquid nitrogen, liquid oxygen and pressurized helium under rigorous extremes of heat, cold and other environmental conditions. The valve illustrated, developed for a rocketry application, is an example of our capabilities in this field.

If you have a problem involving specialized valves, we invite you to contact us.

THE GARRETT CORPORATION
AiResearch Industrial Division
9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS


GOODYEAR INDUSTRIAL PRODUCTS
GM-Specified Style MHB
Rubber Covered Fire Hose
C
B
A
A Smooth, nonporous, long aging synthetic rubber tube
B Single horizontal braided construction combines strength with light weight and maximum flexibility
C Synthetic rubber cover resists oil, abrasion, sun and aging

G.T.M. offers the hottest thing in fire hose

THERE has long been need for a tougher, lighter weight fire hose with greater resistance to oil, abrasion and weather – especially around refineries and on oil transport vessels.

After thorough analysis of the problem, the G.T.M.–Goodyear Technical Man–and his colleagues, came up with the answer. It is a completely new hose – Style MHB Rubber Covered Fire Hose.

This new rubber hose is exceptionally flexible and light in weight. It is reinforced with a horizontal braid of high tensile synthetic fiber for extra strength. It is mildew inhibited throughout. And its specially developed rubber cover not only resists oil but snagging and hard wear as well.

If you want fire or wash hose that's built to withstand the toughest service, consult your Goodyear Distributor and/or the G.T.M. Or write, Goodyear, Industrial Products Division, Akron 16, Ohio.

RUBBER COVERED FIRE HOSE by

GOODYEAR

THE GREATEST NAME IN RUBBER

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

GASO HORIZONTAL TRIPLEX PLUNGER PUMP

FIG. 3466—2½" TO 3½" x 4"

MAXIMUM SPEED: 250 R.P.M.
MAXIMUM CAPACITIES AND PRESSURES:
91 Bbls. per Hour at 1180 p. s. i.
179 Bbls. per Hour at 600 p. s. i.

A NEW GASO MODEL

GASO'S Figure 3466 Horizontal Triplex Plunger Pump is a rugged 4" stroke high speed single acting plunger power pump for use where moderate capacities and medium to high pressures are required for crude oil gathering systems, movement of refined petroleum products, salt water disposal, water flooding and fresh water supply.

These pumps are available in complete skid mounted pumping units with gas, gasoline, or diesel engines or electric motors of various makes to suit the customer's preference. Horse power requirements will vary with pump speeds, plunger sizes, and working pressures. Consult our sales and engineering staff for recommendations and suggestions. Each unit will be properly engineered to suit your needs.

Construction Features of this pump emphasize simplicity and strength, a minimum number of parts, and easy maintenance.

The Power Frame is a high strength close grained grey iron casting, fully enclosed. All moving parts in the power end are self lubricated by splash system from oil in the crank case.

The Crank Shaft is a heavy alloy steel casting riding in large tapered roller bearings, 3" I. D. x 7½" O. D. x 2¼" wide, mounted in each side of the power frame. One end of the shaft extends to the outside of the power frame for mounting V-Belt sheave or coupling. This permits the driving power to be transmitted directly to the crank shaft. This shaft extension is 2 15/16" diameter and can be from either side of the pump.

Connecting Rods are steel castings with renewable babbitt lined steel shell bearings 3¾" I. D. x 3" wide in crank end, and bronze bushings 2" I. D. x 3" wide in the crosshead end.

Crossheads are cylindrical type semi-steel castings 7" O. D. x 7" long with outer surface ground and polished and lube-lok coated. The crosshead pins are hardened and ground steel pins, 2" diameter.

The Fluid End Body is a single piece casting. Molybdenum alloy iron is standard for crude oils, petroleum products, and fresh water. Aluminum bronze alloy is standard for salt water. Cast alloy steel bodies can also be furnished when special safety specifications demand it.

Cylinder Heads and Valve Chamber Covers are interchangeable. They are either alloy cast iron or aluminum bronze alloy, same as standard fluid end bodies. "O" Ring gaskets are used with these parts.

Standard Plungers for crude oil service are alloy steel, and for salt water service are bronze or stainless steel. Ceramic plungers and hard colmonoy surfaced steel plungers are also available on special order. Regular plunger sizes are 2½", 2¾", 3", 3¼", and 3½".

Fluid End Plunger Stuffing Boxes are sufficiently deep for receiving various types of standard packing rings for pumping ordinary self lubricating fluids. When necessary, the pump can be equipped with a force feed lubricator and special packing sets for plunger lubrication.

The Packing Glands are either alloy iron or aluminum bronze alloy castings. Three studs and nuts for each gland provide for even take-up.

Valve Assemblies for suction and discharge are interchangeable. Standard equipment consists of stem guided Durabla stainless steel valve discs and hard bronze seats or cast iron seats.

Dual 4" 150# ASA Suction Flanges and dual 2" 600# ASA Discharge Flanges provide for pipe connections to both sides of the fluid end.

Net Weight of pump is 2150 pounds.

GASO PUMP & BURNER MANUFACTURING CO.

Main Office and Plant: **902 EAST FIRST STREET, TULSA, OKLA.**

Export Office: **149 BROADWAY, NEW YORK, N. Y., U. S. A.**

EXCLUSIVE DISTRIBUTORS:

Shreveport, La.—W. L. Somner Co.
Odessa, Texas—W. L. Somner Co.
Brookhaven, Miss.—W. L. Somner Co.
Tinsley, Miss.—W. L. Somner Co.
Long Beach, Calif.—Power Pumps, Inc.
Houston, Texas—Peddlers, Inc.
Wichita Falls, Texas—Pump Engineering Co.
Evansville, Indiana—Hague Equipment Co., Inc.
Casper, Wyoming—Lufkin Foundry & Machine Co.
Edmonton, Alberta, Canada—Lufkin Machine Co. Ltd.

Tidewater's new Delaware Flying A Refinery near Delaware City, Delaware

Electricity... instead of steam... powers most of refinery processing equipment

Unique electrical distribution system provides outstanding power continuity

Tidewater Oil Company's new 130,000-barrel-per-day Delaware Flying A Refinery in Delaware, designed and constructed by C. F. Braun & Co., is of special interest because of the high degree of dependence placed on the electrical distribution system. This is especially significant since it is the world's most modern refinery, with the largest initial capacity of any refinery yet built.

With continuity of power a "must"—for even a power failure of a few seconds cannot be tolerated—the problem was to work out systems and components which would set a new high in continuity of operation.

In doing this, certain motors were modified for 250% breakdown torque at normal voltage to meet the special requirements for re-acceleration after a fault. It was then necessary to design the control with low drop-out characteristics.

This meant the closest type of relationship was required between all the Allis-Chalmers engineering departments concerned, and C. F. Braun & Co., prime contractors for the tremendous project.

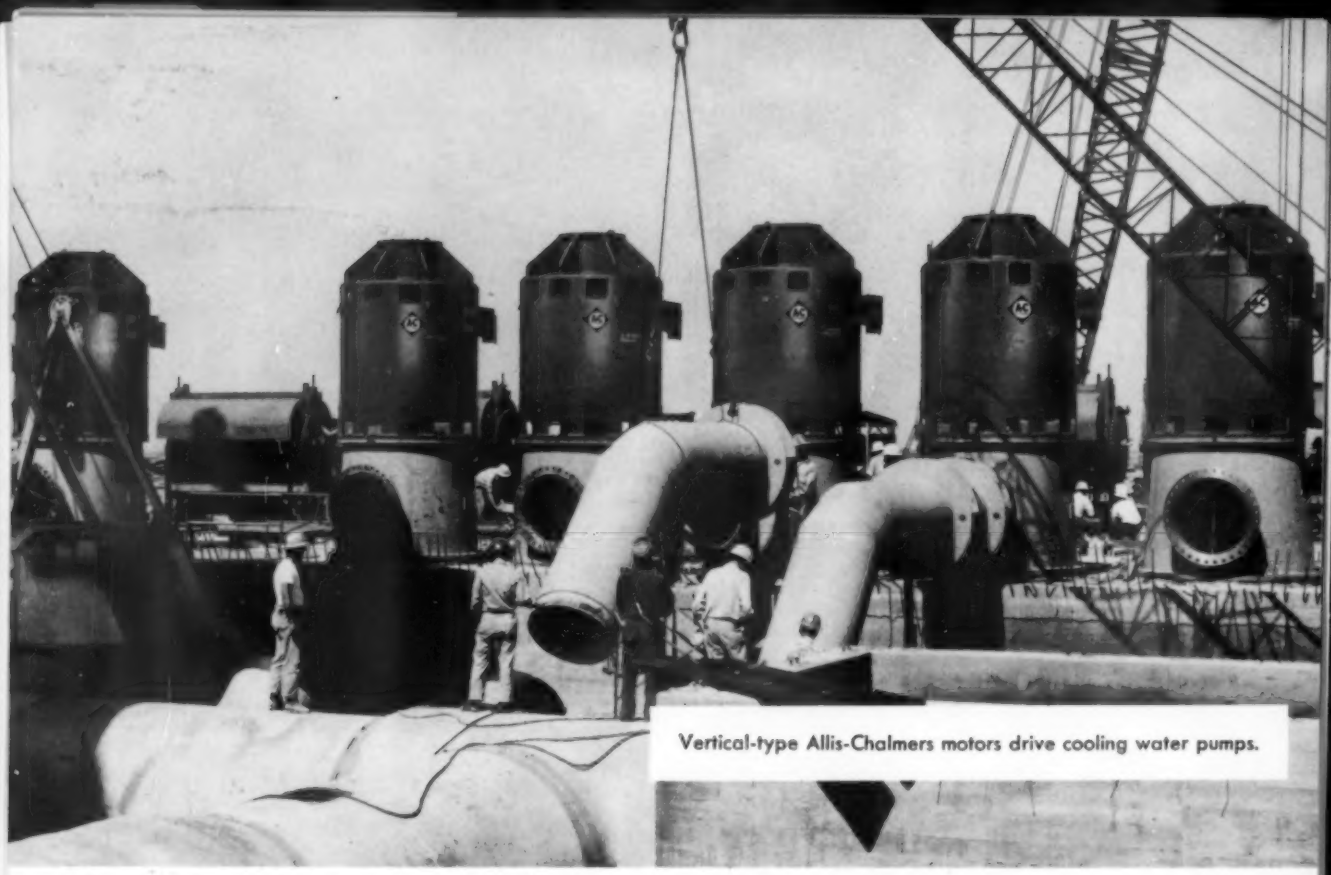
As on other complex jobs, group effort was used to provide coordination between departments, and to take advantage of the variety of experience in each department. Conference phone calls were used to handle matters of delivery and design modifications that came up during construction. In this way, problems could be considered quickly and decisions made immediately.

A network analyzer was used extensively to study the effect on the system of the worst possible faults, thus saving months and months of calculations.

Experience and coordination like this is available to you on applications involving Allis-Chalmers broad line of electrical equipment. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

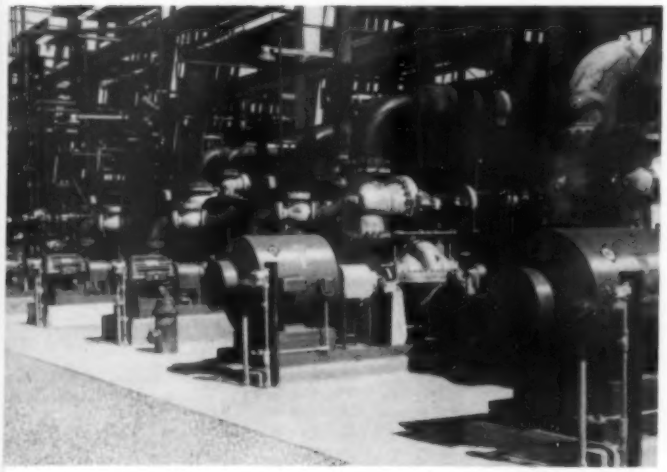
ALLIS-CHALMERS

A-5247

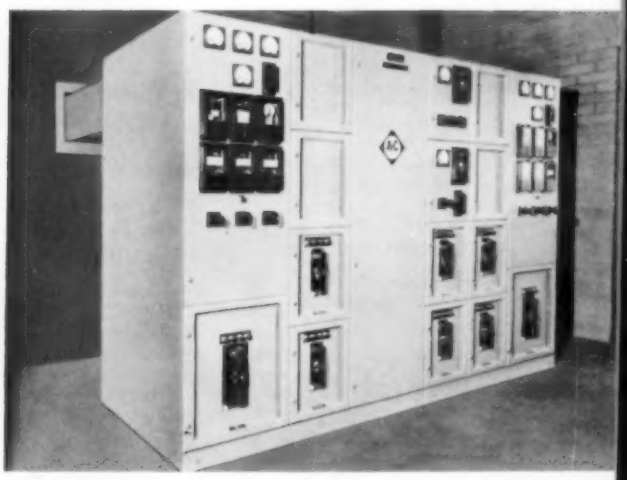


Vertical-type Allis-Chalmers motors drive cooling water pumps.

Electricity at work throughout



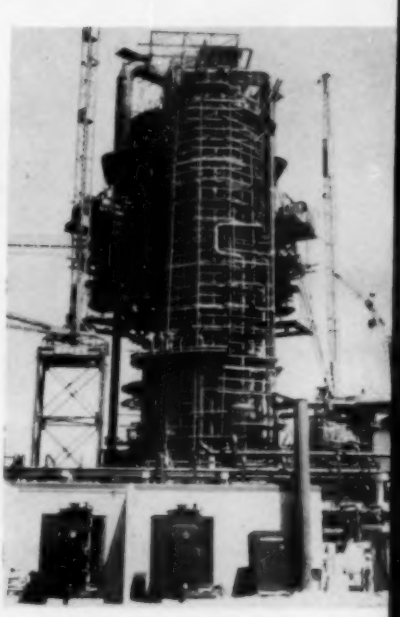
A few of the 300 Allis-Chalmers motors used for driving pumps, compressors and other equipment. Motors in foreground feature tube-type, air-to-air heat exchanger.



Allis-Chalmers new low voltage switchgear incorporates selective trip, an absolute requirement on the job, in addition to its many other features.

ALLIS-CHALMERS

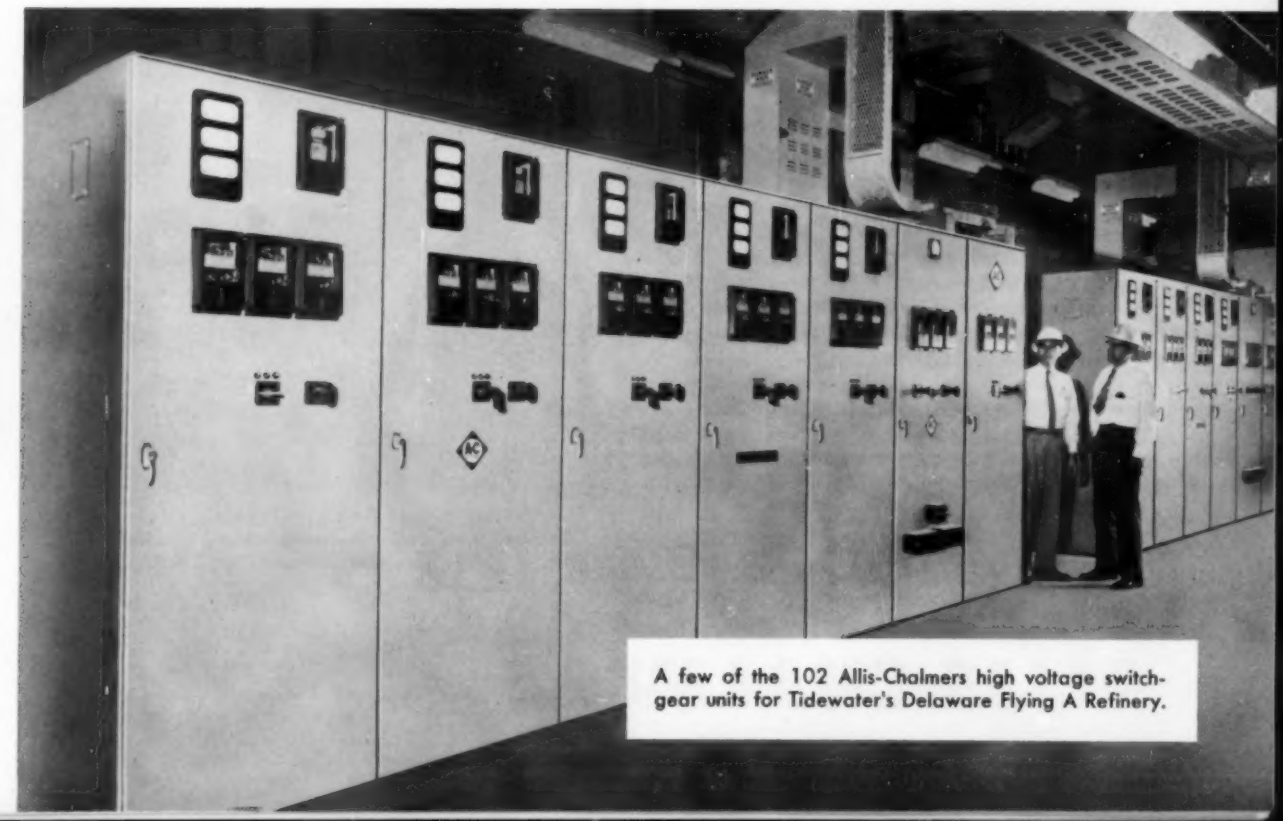
All the motor control and switchgear are located inside switch houses. These buildings are pressurized to exclude explosion vapors. Bus duct systems are pressurized.



All transformers are oil-insulated, sealed-tank construction with welded-on tubular radiators. They are equipped with high voltage disconnecting switches, capable of breaking magnetizing current. Fan motors are explosion-proof.

Teamwork! A part of the Allis-Chalmers coordinating team is shown during one of frequent meetings.

Tidewater's New Refinery



A few of the 102 Allis-Chalmers high voltage switchgear units for Tidewater's Delaware Flying A Refinery.

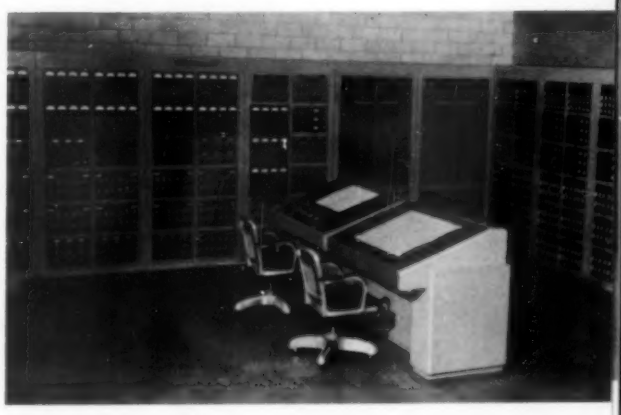
More than 125 high voltage motor controllers are used at the new Delaware Flying A Refinery.

Motor Control is one of the Key Factors in assuring Power Continuity

To permit motors to remain on the line through severe system voltage disturbances, important design developments were made in both the 2300-volt motor control circuits and main motor starting contactors.

The magnetic circuit of the high voltage air contactor was redesigned so that it would remain closed, even though magnetically held, for a period of 19 cycles after complete loss of power. In addition, the magnetic circuit remains sealed even when the voltage drops to 35% of normal.

Get details! These developments are important wherever continuity of operation is vital. Allis-Chalmers engineers can help you. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



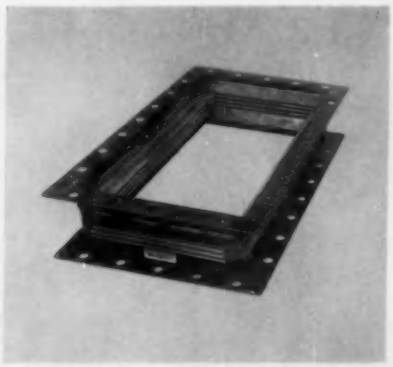
Two separate studies were made using a network analyzer. Teams from Allis-Chalmers and C. F. Braun & Co. worked together to assure power continuity.

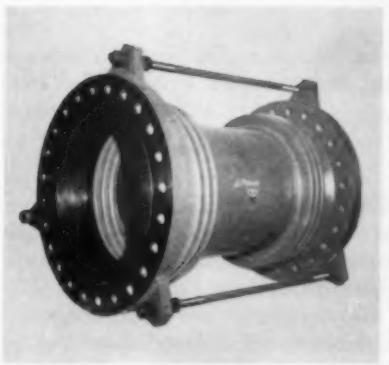
ALLIS-CHALMERS

SOLA-FLEX®

THE FINEST IN EXPANSION JOINTS AND BELLOWS

MADE IN ALL SIZES AND VARIETIES





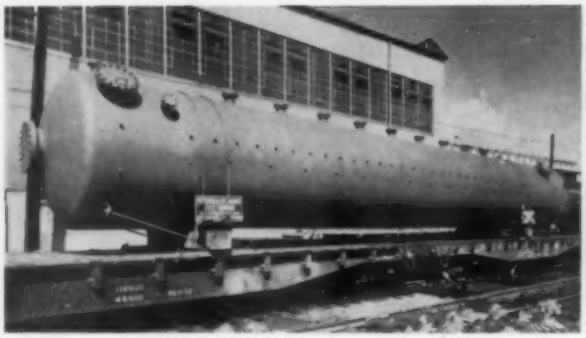
THE SOLA-FLEX LINE is the most comprehensive in the world. It includes many basic types of expansion joints—convoluted, U-span, rectangular, and others. Sizes range from ½ in. to 35 ft in diameter. Pressure ranges run from full vacuum to 600 psi on standard units and up to 3500 psi on special applications. Bellows have been built for service from —300 F to 2000 F. Materials used include all types of steels and a variety of high alloys.

Pipe expansion problems increase with higher pressures, temperatures and smaller space. Sola-Flex joints provide the answer—with economy and efficiency. Write for catalog today. Dept. C-151, Solar Aircraft Company, San Diego 12, California.

SOLAR AIRCRAFT COMPANY

SAN DIEGO
DES MOINES

Designers, Developers and Manufacturers • Gas Turbines • Aircraft and Missile Components • Bellows • Controls • Coatings • Metal Alloy Products

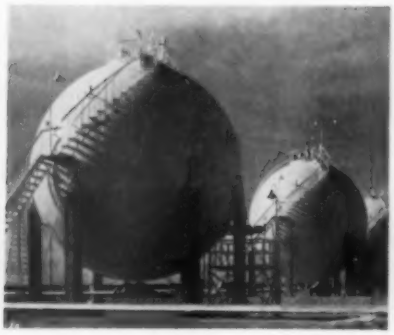


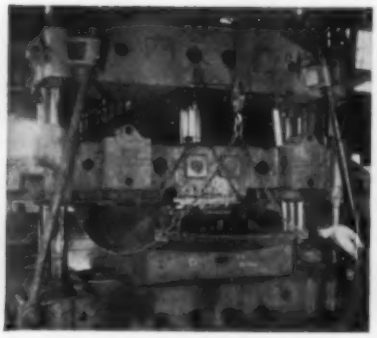
Pittsburgh-Des Moines

PRODUCTS Tanks, A.P.I. • Tanks, special • Tanks, insulated Tanks, lined • Elevated tanks • Pressure vessels • Spheres Plate construction • Large diameter piping • Structural steel Industrial type buildings • Steel bridges

MATERIALS Pittsburgh-Des Moines builds tanks, vessels and structures of steel, stainless steel, stainless clad steel, alloys and aluminum

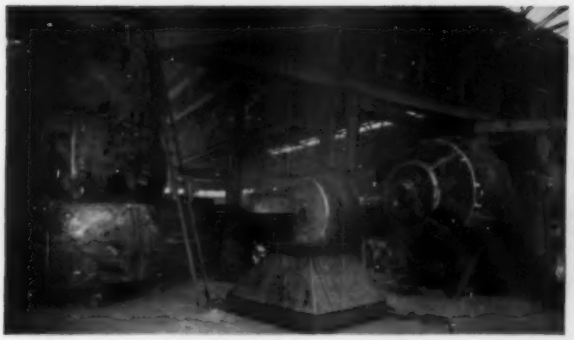
SERVICES Pittsburgh-Des Moines' complete service to the client includes *design*, to accomplish required objectives—*selection of material*, proper for service needs—*preparation of detailed drawings*—*fabrication*—and *delivery and erection or installation*. Included also are the design, procurement and installation of all associated items such as foundations, pumps, compressors, coolers, dryers, piping, insulation, refrigeration, controls, electric wiring, etc.

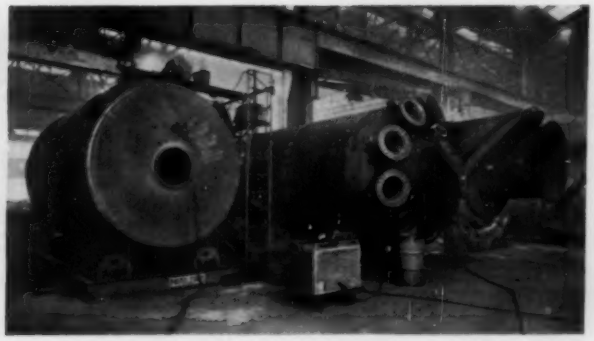




Plants at
PITTSBURGH DES MOINES
SANTA CLARA FRESNO
and CADIZ, SPAIN

PITTSBURGH-DES MOINES

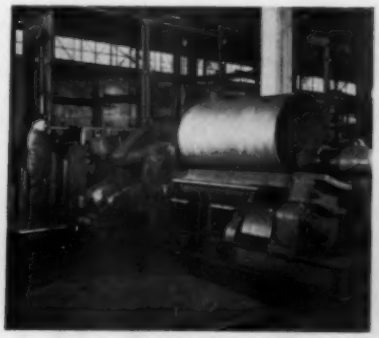




and the Petroleum Industry

SCOPE The range of PDM product manufacture includes tanks, vessels and plate construction of plates from $\frac{1}{8}$″ to 4″ thick, shop-built vessels and structures, weighing up to 100 tons, and field-assembled vessels or structures of any size. Electric welding is employed in shop and field, together with riveting wherever necessary. Electric welds are radiographed as required, using X-ray and radioactive isotopes. Shop stress-relieving of vessels and structures is provided, and at Pittsburgh is installed one of the largest stress-relieving furnaces in the country— 85 feet in length. Stress-relieving of field welds is employed where practicable. Steel grit blasting is used for cleaning of metal surfaces; the protective coating of metal surfaces is a well-researched PDM specialty. Also available is spray metallizing of steel, as required.

RESEARCH Pittsburgh-Des Moines for many years has maintained a full Chemical Storage Fellowship at Mellon Institute of Industrial Research, where basic studies are in continual progress on the storage of liquids and gases—particularly in pressure tanks, with insulation for hot or cold storage, and in the storage of corrosive liquids and liquids that turn to gases at atmospheric pressure. Answers to problems of design, the application of materials, or questions of procedures where information is not readily available, are developed from data of record or actual research and testing with the exceptional facilities provided.



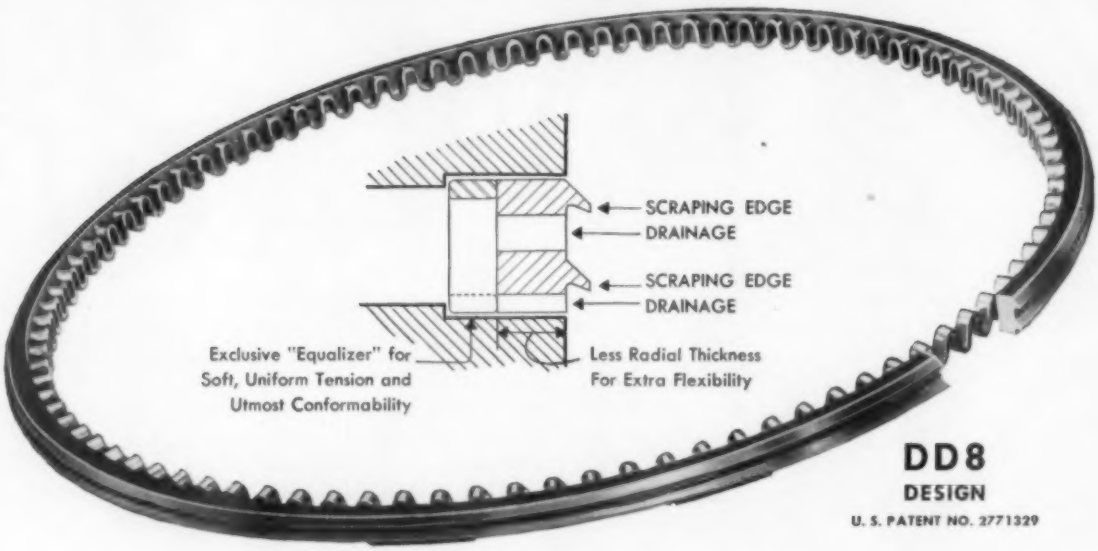
STEEL COMPANY PDM

Sales Offices at

PITTSBURGH (25), 3496 Neville Island • **NEWARK (2),** 280 Industrial Office Bldg. • **CHICAGO (3),** 1202 First National Bank Bldg. • **EL MONTE, CAL.,** P. O. Box 2068 • **DES MOINES (8),** 997 Tuttle Street • **DALLAS (1),** 1201 Praetorian Bldg. • **SEATTLE,** 506 Lane Street • **SANTA CLARA, CAL.,** 603 Alviso Road

Another PEDRICK *"First"*

A Single-Piece Cast Iron Conformable Oil-Control Piston Ring with TWO Scraping Edges and Drainage Under Each!



Pedrick Conformable FORMFLEX Double-Drain Oil Ring

Pedrick's DD8 Formflex oil ring assures far better oil control, especially on pistons with oil drainage through the grooves instead of below the grooves. Three of the most important reasons are:

1. TWO oil-scraping edges.
2. TWO sets of drainage channels or slots, one under each scraping edge.
3. Exceptional *conformability* for positive contact with the cylinder wall under even the most severe conditions.

Conformability is assured because of Pedrick's exclusive "Equalizer," a special design of steel expander which exerts a uniform pressure all the way around the cast-iron cylinder-contacting ring. The radial thickness of the cast-iron ring is less also, which increases its flexibility.

The Pedrick FORMFLEX Double-Drain DD8 oil ring, therefore, provides quicker, more effective drainage, and increased performance efficiency in all piston-groove styles. It is easy to install and moderate in cost.

This is just one of a family of top-flight ring designs which Pedrick has available to assure you long dependable, low-cost engine operation. Say the word and our engineers will be glad to consult with you. WILKENING MANUFACTURING CO., Philadelphia 42 and Toronto 2.

Pedrick PISTON RINGS

PEDRICK PIONEERED *Conformable* RINGS FOR BIG-BORE ENGINES

ADVANCED DESIGN HYDRAMOTOR

A MOTOR VALVE YOU CAN USE ANYWHERE!

Here is a motor valve that's truly versatile... the General Controls Hydramotor! A complete line covers positive shut-off control for gases and liquids at all pressures, and they're at home anywhere, inside or out, hot or cold.

Simple, rugged electro-hydraulic operators operate on two-wire electrical circuits... they fail-safe under powerful steel spring closure in the event of power interruption. Fast and slow opening and closing speeds available.

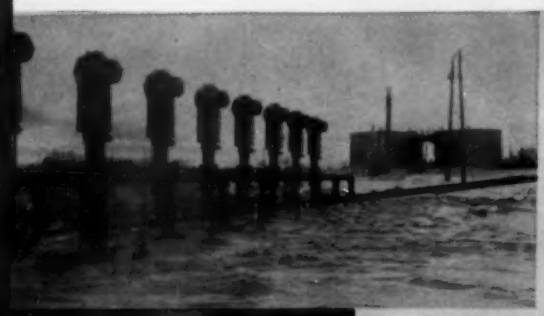
Write today for the complete Hydramotor Catalog, or contact the nearest General Controls branch listed in the yellow pages.

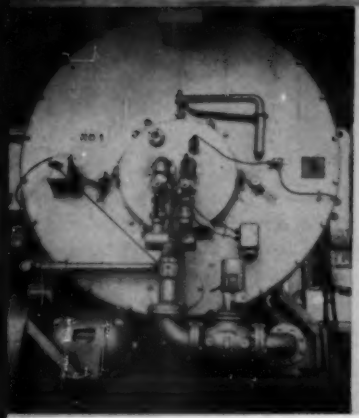
GENERAL CONTROLS HYDRAMOTOR ®

Hydramotor H-3 – This model has cast carbon steel body gate for tight shut-off of gas, oil or liquids. 1000 psi. Motor is explosion-proof, weather-proof. Typical use: high pressure shut-off on oil wells.

NO BRAWN NEEDED

This ion exchange chamber for boiler feedwater treatment has 17 Hydramotors for flow control. The boiler room crew can busy itself on more important duties than tending valves!





RUGGED, OUTDOOR TYPE

These gathering system valves are always ready. A simple two-wire circuit is all you need to control a Hydramotor. It works easily at any temperature... arctic cold or desert heat, where personnel couldn't ordinarily reach a manual valve.

POSITIVE SHUT-OFF

sold this package boiler manufacturer on applying this Hydramotor on the fuel line to this big gas-fired boiler... he wanted positive shut-off, tight sealing, in current failure or "over temperature" situations. FM & U.L. approved.

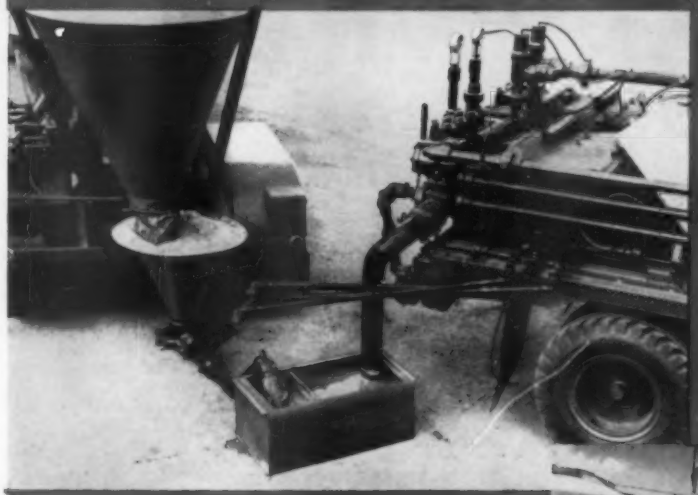
Five Plants:
Glendale, California
Burbank, California
Iron Mountain, Michigan
Skokie, Illinois
Guelph, Canada

GENERAL CONTROLS

America's Finest Automatic Controls for Home, Industry, and the Military

Factory Branch Offices Serving *All* Principal Cities of the United States and Canada

SEAL OFF THIEF ZONES AS YOU CEMENT



with
HALLIBURTON
LOST CIRCULATION
MATERIALS

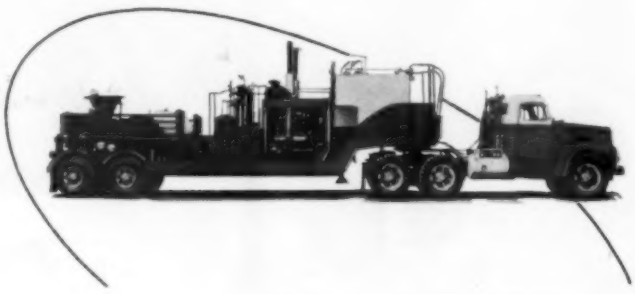
In primary cementing, you want the cement in the annulus. But, loose, porous formations often rob you of cement and the resulting lost circulation makes it impossible to place cement where you want it.

Solving difficult lost circulation problems is one of the plus benefits you get when you specify Halliburton Cementing Service. You get better primary cementing that can forestall remedial operations later because Halliburton provides Equipment, Tools, Techniques and Materials best suited to the requirements of your particular well.

Take advantage of Halliburton's experience to help you save the high cost of remedial work by correcting lost circulation conditions. Call the local office or write to the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

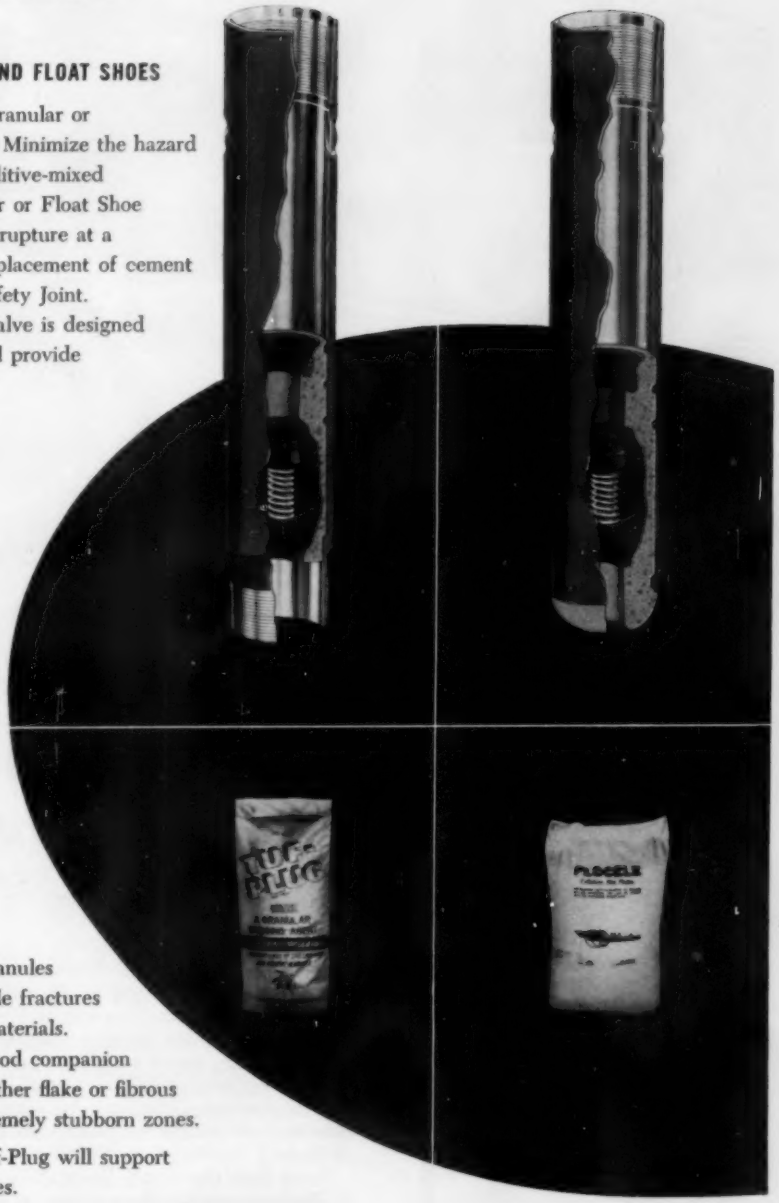
OIL WELL CEMENTING COMPANY



HALLIBURTON TOOLS AND MATERIALS
HELP SOLVE LOST CIRCULATION PROBLEMS

"ADMIX" SAFETY FLOAT COLLARS AND FLOAT SHOES

Provide protection when pumping granular or flake additives in the cement slurry. Minimize the hazard of leaving the casing filled with additive-mixed cement in the event the Float Collar or Float Shoe becomes plugged. The Safety Plugs rupture at a predetermined pressure, permitting placement of cement through ports thus formed in the Safety Joint. The Halliburton Super Seal Float Valve is designed to "float" the string into the hole and provide positive leak-proof shut-off from well fluids below.



HALLIBURTON'S FLOCELE

When added to cement slurries, Flocele effectively bridges and seals most fissures and other thief zones. It prevents or lessens loss into permeable formations during casing cementing. Flocele is chemically inert cellulose film flake which does not affect the pumping or setting properties of cements... Economical, usually a mere ¼ to 1% of Flocele is sufficient.

TUF-PLUG

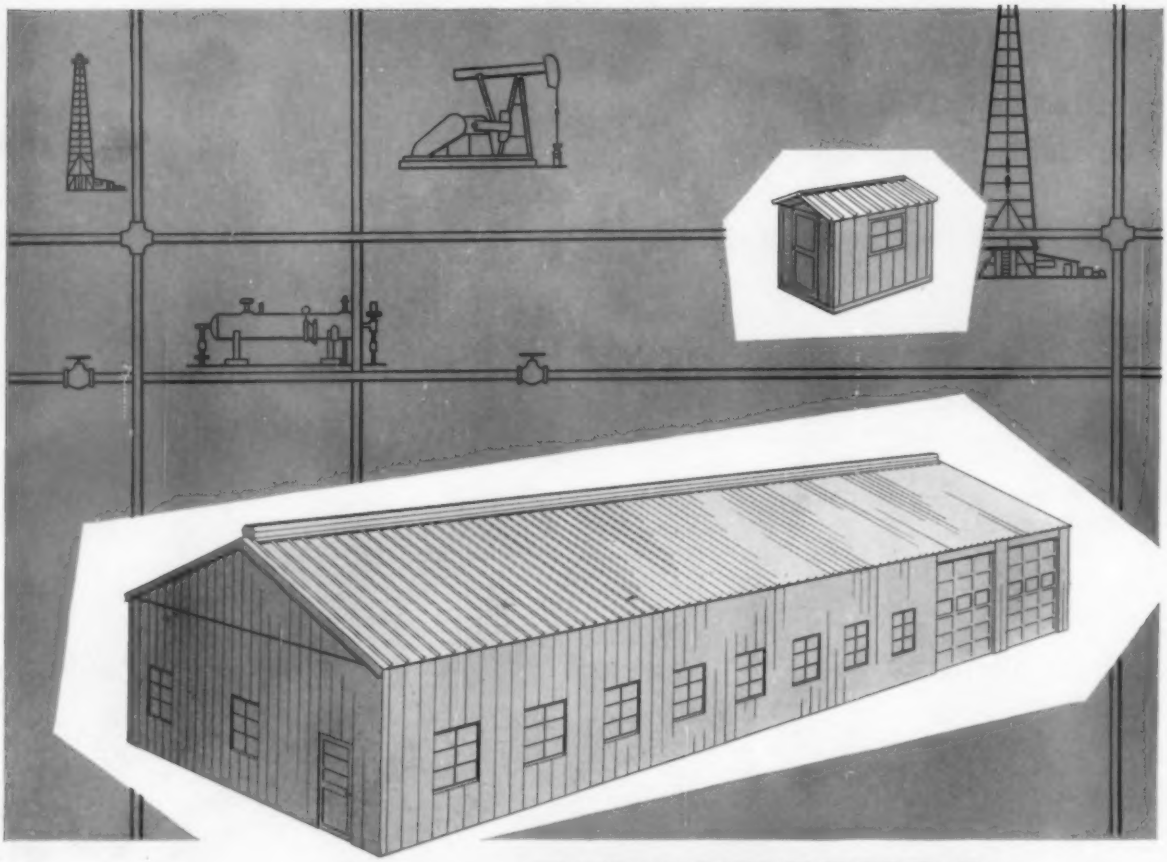
Tuf-Plug's high strength, angular granules in cement slurries quickly bridge wide fractures more effectively than most fibrous materials. Effective alone, Tuf-Plug is also a good companion material to use in conjunction with other flake or fibrous lost circulation materials to seal extremely stubborn zones.

The high mechanical strength of Tuf-Plug will support high columns of heavy cement slurries.

Ask for your free copy of Halliburton's Report on Lost Circulation Materials

HALLIBURTON
CEMENTING SERVICES

251 SERVICE CENTERS – JUST MINUTES AWAY FROM ANY RIG



a vital part of the picture . . .

PARKERSBURG

PRE-ENGINEERED METAL BUILDINGS

Parkersburg's top-quality, pre-engineered metal buildings are serving in hundreds of different ways to provide quick, rugged, weather-tight construction in the field. These precision-fitted units feature unique "seven-fold" interlocking joints offering the tightest, most rigid weather seal available today.

Parkersburg metal buildings can be moved or enlarged . . . be finished or insulated . . . will withstand driving rain, dust, snow, and high winds. They can be erected quickly and economically into attractive units ranging in size from tool sheds to large storage or factory buildings.

Look into the many Parkersburg advantages today . . . Write to Department B-2 for additional information. The Parkersburg name is your guarantee of unequaled quality.

60 years of successful service!

"WISE IN THE WAYS OF METAL BUILDINGS"

BUILDING PARKERSBURG DIVISION

THE PARKERSBURG RIG AND REEL COMPANY
Division of Parkersburg-Aetna Corporation
Parkersburg, West Virginia

Factory Locations: Parkersburg, West Virginia; Pomeroy, Ohio; Coffeyville, Kansas; Houston, Texas.

Building Division Sales Office: Dallas, Atlanta, New York, Chicago, Parkersburg.

DU PONT *Petroleum Chemicals* NEWS

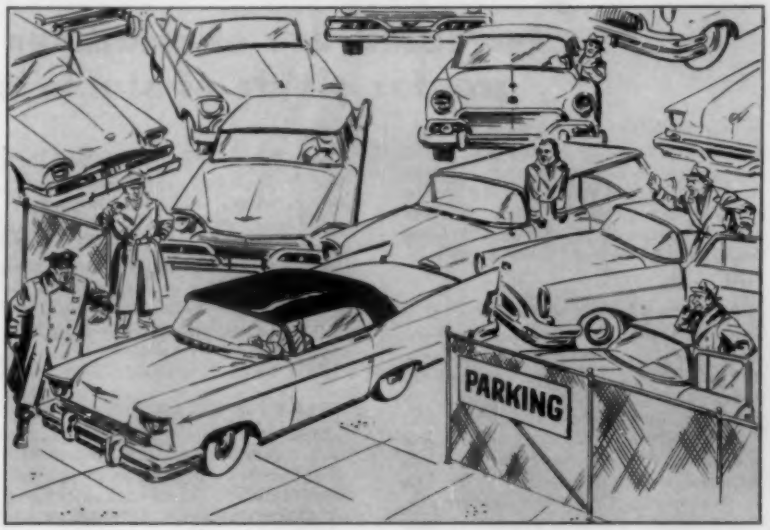
One of a Series of Bulletins for the Petroleum Industry

APRIL 1957

Experiments reveal facts about carburetor icing

Recent experiments indicate that stalling due to carburetor icing occurs even in 55-degree weather. Moreover, they prove that Du Pont DMF (dimethyl formamide) provides the motorist with protection against this type of hazard and annoyance.

Stall-prevention is especially important in many cars having power brakes and power steering—both of which are less effective when the car-engine stops.



STALLS DUE TO carburetor icing often happen at the most inconvenient times, such as the rush-hour traffic jam in the parking lot above—caused by the stalled car at the exit gate. Our growing traffic congestion especially points up the need for eliminating situations like this. When Du Pont DMF is added to gasoline, it effectively prevents carburetor icing stalls which occur under a wide range of temperature and humidity conditions.

Dimethyl formamide proved effective in low concentrations

Its practical use concentration turned out to be under 0.10 volume per cent—in other words, less than three milliliters per gallon!

Long stalling season

Conditions under which your customers' cars can stall also became clearer. The "refrigerant" action of gasoline can lower the temperature of carburetor parts to freezing even on comparatively warm days. Generally speaking, temperatures from 22 to 55 degrees Fahrenheit can lead to carburetor icing when humidity is 65 per cent or higher.

Expanding de-icer market

Motorists are showing an ever-increasing interest in gasoline performance. By anticipating a greater demand next fall for gasolines which contain anti-stalling agents, you can increase the

GENERAL MANAGER ORGANIC CHEMICALS DEPARTMENT

SAMUEL G. BAKER began his career in 1923 on a dynamite production line at the Du Pont explosives plant in Washington. Six months later, he left the company to resume his university career.

After graduating in chemical engineering from the University of Washington, Mr. Baker returned to Du Pont

in 1925 as a chemist at the Eastern Laboratory and the Repauno Works in Gibbstown, New Jersey. In 1939, he was named Director of Sales of High Explosives Manufacturing Division. Four years later, Mr. Baker joined the Electrochemicals Department, where he became General Manager in 1948.

He became General Manager of the Photo Products Department in 1950. The Organic Chemicals Department is the third department Mr. Baker has headed. He was appointed General Manager of that department late last year.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DUPONT *Petroleum Chemicals* NEWS

New Du Pont engine assembly demonstrates carburetor icing

MARKETER:

So this is the apparatus you use to demonstrate carburetor-icing characteristics of gasolines?

DU PONT REPRESENTATIVE:

Yes, it consists of a 1.6-horsepower engine connected to a small ice tower by a glass tube manifold.

MARKETER:

I see there's a build-up of ice on the little metal throttle plate in the tube . . .

DU PONT REPRESENTATIVE:

That's right. The fuel being tested contains no anti-icing additive—see, the engine just stalled! Now watch it take hold again when the DMF is added.

MARKETER:

Say, this unit would come in handy at our next dealer meeting . . .

DU PONT REPRESENTATIVE:

We'll help you build one. You'll find it very convincing for selling dealers and customers on your new NO-STALL GASOLINE with DMF.

Increased use of additives leads to greater yields of stable products

When insoluble residues form in distillate fuels, it usually means trouble for the user – and often for the supplier. Maintaining fuel stability is the key to solving this problem. And, in most cases, the use of additives has been found to be the most economical solution.

The trouble and the cure

Residue formation is more of a problem today than ever before because of the increased use of catalytically cracked stocks. Although cat-cracked stocks are as good as straight-run stocks in heating value, they are generally less stable in storage. As a result, users experience troubles caused by sludge.

In the case of domestic heating oils, for example, unstable stocks can lead to plugging of filters, nozzles and other parts. Du Pont Fuel Oil Additive No. 2 (FOA-2), a stabilizer and dispersant, inhibits the formation of those sediments.

Diesel fuels improved with FOA-2

Users of diesel fuels also encounter stability problems. The formation of insoluble residues in cat-cracked stocks can lead to injector-sticking, build-up of undesirable deposits in combustion chambers and loss in engine performance. Diesel fuel refiners are discovering that these problems, too, can often be overcome by the addition of Du Pont FOA-2 to their cat-cracked stocks.

FOA-2 is ideally suited for stabilizing all types of fuel oils. A small amount will not only prevent formation of residues, but will disperse them as well. Thus it tends to rid oil-feed systems of any sludge that may have previously formed.

Technical paper available

As the need for greater fuel stability grows, you will be looking for the most economical way of obtaining it. In a technical paper entitled "Improving Fuel Oils through the Use of Additives," W. deB. Bertolette and J. D. Rogers describe additive treating as a relatively simple operating procedure and point out how economical it is compared to refining or other treating processes.

To get your free copy of this paper, just send your request to any of our sales offices listed on this page.

CONTINUED *Carburetor Icing*

number of your cold-weather customers. Now is the time to anticipate the day when temperatures begin dropping below 55 and carburetor icing begins.

Economy and reduced storage

DMF offers two important benefits—economy and minimum storage-space requirement. The low volume concentration that's needed represents a real saving in freight and blending costs. And, because of the high efficiency of Du Pont DMF, and the low concentration required, little storage space is necessary.

See the "demonstration" of DMF, top of page.

A Du Pont Petroleum Chemicals Division representative will be glad to give you more detailed information on DMF. You can contact him at any of our sales offices listed at right.

SALES OFFICES

Chicago 3—8 So. Michigan Ave. . . . RAndolph 6-8630
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Houston 2—705 Bank of Commerce Bldg. . . . . CApitol 5-1151
Los Angeles 17—612 So. Flower St. . MAdison 5-1691
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Pittsburgh 22—1 Gateway Center . . . ATlantic 1-2933
San Francisco 4—111 Sutter St. . . . EXbrook 2-6230
Seattle 3—4003 Aurora Ave. . . . . MElrose 6977
Tulsa 1—1811 So. Baltimore Ave. . . . . LUther 5-5578
In Canada—Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**—Ontario . . . . . HUdson 1-6461
In Other Countries—Petroleum Chemicals Division, Export Sales, 7496 Nemours Bldg., Wilmington 98, Del., OLympia 4-5121, Ext. 2962

DU PONT
REG. U. S. PAT. OFF.

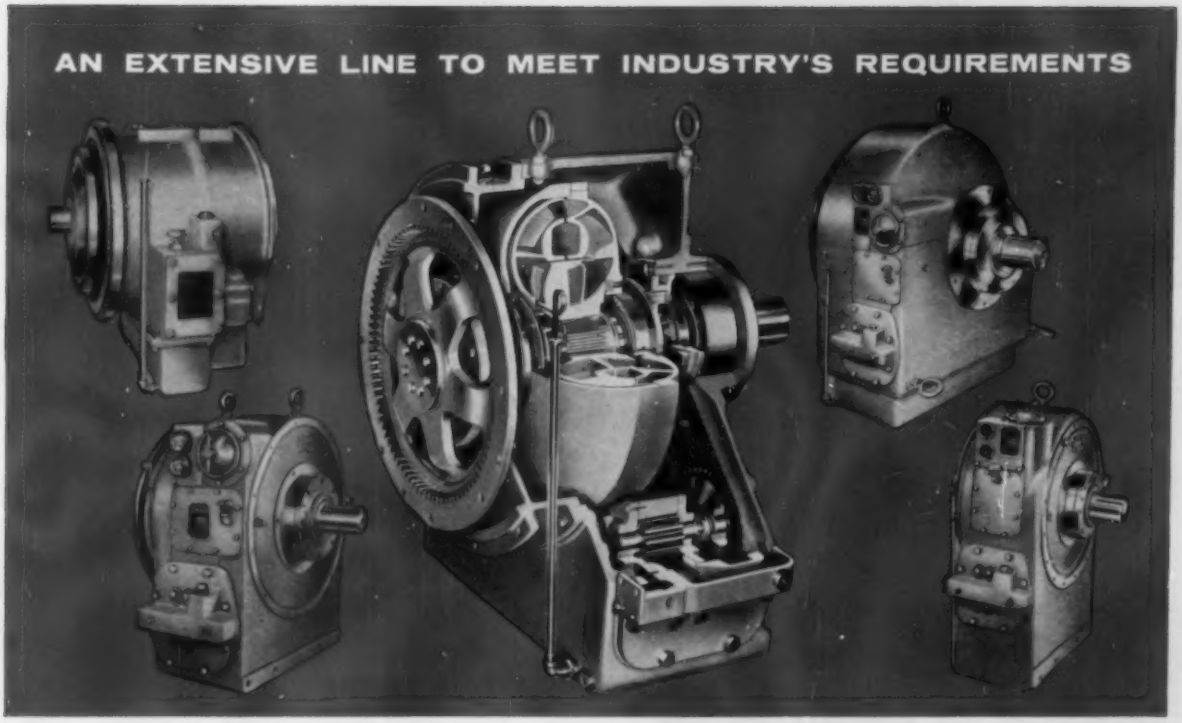
Better Things for Better Living
. . . through Chemistry

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

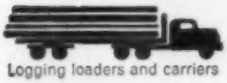
A-4216

Printed in U. S. A.



You name your need--
then talk to Clark

Excavator-cranes and similar heavy machines



Logging loaders and carriers

Graders and other road machinery

Tractor shovels and construction machinery

Drilling rigs and other stationary power plants

Two decisive advantages are yours when you choose a Clark Torque Converter—

1. You get a unit of unsurpassed excellence, known for high efficiency and trouble-free durability
2. You get a unit engineered to the power demands of your job

For a quick, convincing story of dependable fine quality, check the exclusive advantages of Clark design—then send the coupon for full information.

CHECK THESE VALUE FEATURES

True Hydra-Foil Blade Design—a patented combination of blade contour and blade angle prevents cavitation, assures most efficient torque multiplication.

Self-contained Oil Circuit—sump and oil passages integral in the housing casting—no fittings, no leakage.

Easy Accessibility—no special tools for inspection.

No Welds, No Fabrications—no distortion under extreme load.

Industry's Broadest Line—horsepower range from 15 to 600; diameters 11 to 26 inches.

For cranes, shovels, logging loaders, drill rigs, grading machines, heavy duty vehicles for on-and-off highway service.

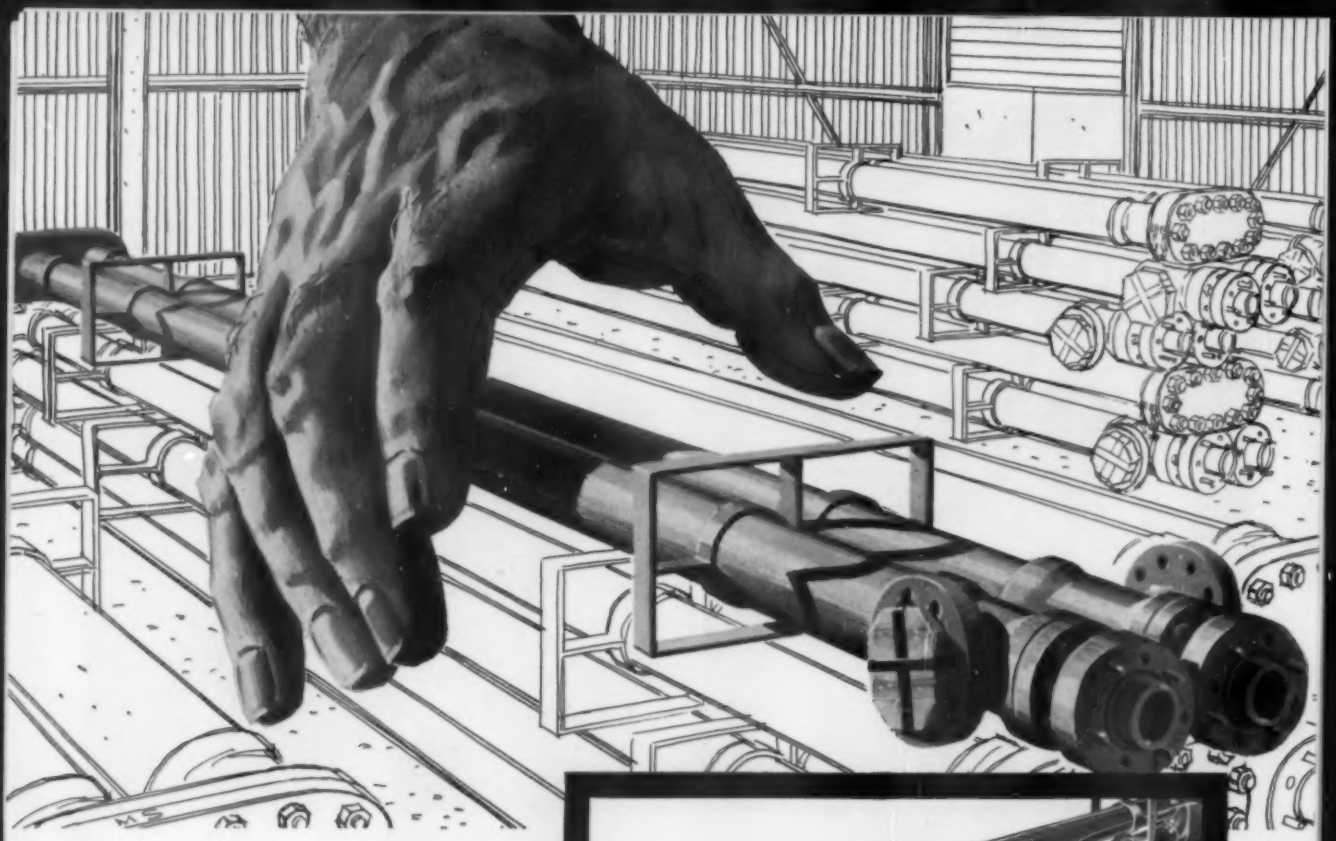
CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY, Falahee Road, Jackson 15, Mich.: Please send the CLARK Torque Converter Bulletin

Name_____ Position_____

Firm_____ Address_____

City_____ Zone_____ State_____



ALCOTWIN Heat Exchangers

Available from Stock Now

ALCOTWIN® heat exchangers are in stock in Beaumont for immediate delivery now. They are available in a number of sizes, for pressures up to 600 psi and temperatures to 650 F.

The flexibility of these "in-stock" ALCOTWINS gives them an unlimited range of uses. You can change load or processes within your plant and still use the same heat-exchange equipment. You can easily add new ones for increased load, or you can rearrange present ones for changing processes.

You select the exact ALCOTWIN for your job. The precise metallurgy needed for optimum results in your application can be selected on special order in an ALCOTWIN. The many combinations of tube and fin materials mean more efficient performance in high temperature services.

Complete information is available from any of ALCO's sales offices. For a copy of Bulletin FH-3, write Petroleum Industry Equipment Division, Dept. AW-2, P. O. Box 1065, Schenectady 1, N. Y.

ALCO

ALCO PRODUCTS, INC.

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Sales Offices in Principal Cities

Locomotives · Diesel Engines · Nuclear Reactors · Heat Exchangers · Springs · Steel Pipe · Forgings · Weldments · Oil-Field Equipment

FISHER

Series 2800

Liquid Level CONTROLS

For use as high and low limit switches, to sound alarms, flash signal lights, start or stop fluid transfer pumps, or to operate control valves.

Series 2800

Series 2800 are dependable, inexpensive, snap acting liquid level controls. They are float actuated and, for maximum versatility, are available with either electric (explosion-proof) or pneumatic switch action. Either pilot type is interchangeable on the same float housing assembly. Stab-in type of tank mounting provides easy installation. Available with 4" iron or steel flanged tank connection. Write for Bulletin F-2800 for complete information.

FISHER GOVERNOR COMPANY
Marshalltown, Iowa • Woodstock, Ontario

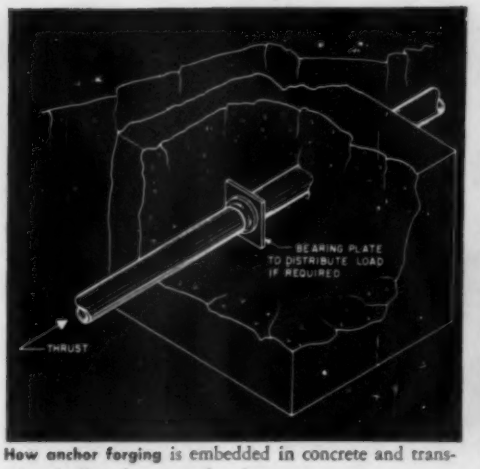
WHOOSH!
NO MORE
OIL FIRES!
Point horn, pull trigger, fire's out! That's all it takes to knock out deadly oil, gasoline, flammable liquid fires with instant-action Kidde dry chemical portable extinguishers! So easy to use, even inexperienced operators get perfect fire-fighting results. Kidde's patented diffuser horn spreads dry chemical powder over wider area for greater fire-killing power. Trigger-finger grip means faster action, feels more natural in the hand. Pick the Kidde dry chemical portable to fit your needs: 5, 10 lb. pressurized (recharged at any commercial air pump), 20, 30 lb. cartridge-operated. For more information, write today for Kidde's P-8 catalog and name of nearest distributor.

Kidde

Walter Kidde & Company, Inc., 454 Main St., Belleville, 9 N. J.

Walter Kidde & Company of Canada Ltd., Montreal—Toronto

Close-up of TUBE-TURN Anchor Forging after butt-welding into 20" line.



How anchor forging is embedded in concrete and transmits pipeline thrusts to the structure.

Completed installation, showing reinforcing structure, ready for concrete.

Hold that line

with the new TUBE-TURN Welding Neck Anchor Forging*

Installing TUBE-TURN Anchor Forging in 20" gas line of Texas Gas Transmission Corp., near Eunice, La. Hubs are butt-welded to pipe ends.

High operating pressure, and expansion forces due to temperature change can team up to produce end thrusts in pipelines of 1,000,000 lbs. or more! Lines may be overstressed and expensive equipment damaged.

TUBE-TURN* Welding Neck Anchor Forgings provide an answer to this problem. Available for pipe sizes 6" through 36".. for operating pressures up to 1200 psig and temperature changes up to 90° F.

In writing for information, provide this data on your application Size, wall thickness and material of matching pipe, design pressure and temperature, special requirements.

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Detroit • Atlanta • New Orleans • Houston • Midland Dallas • Tulsa • Kansas City • Denver • Los Angeles • San Francisco • Seattle

In Canada: Tube Turns of Canada, Ltd., Ridgetown, Ontario • Toronto, Ontario • Edmonton, Alberta

tt TUBE-TURN

*"TUBE-TURN" and "tt" Reg. U. S. Pat. Off.

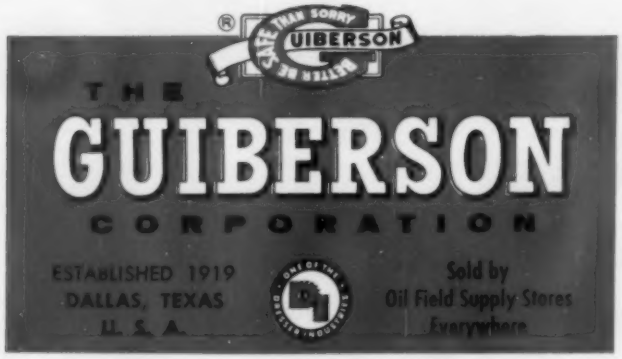
GUIBERSON DRILL PIPE PROTECTOR RUBBERS

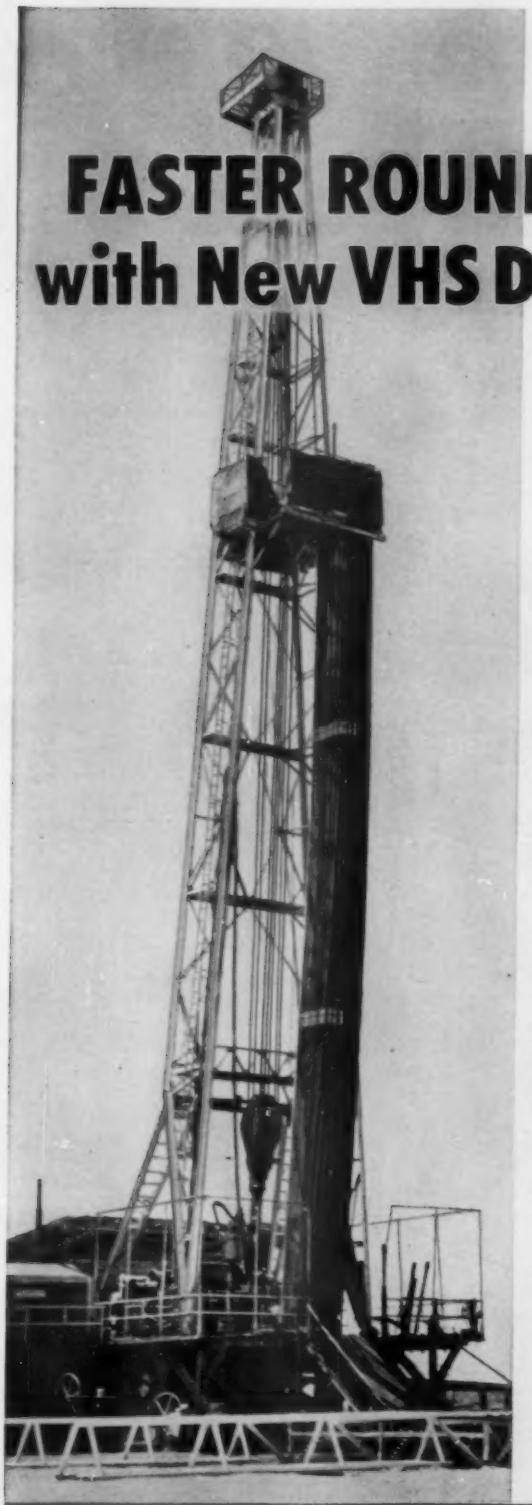
Stay Put.. Keep Their Grip.. Keep Their Size..

Guiberson drill pipe protector rubbers show their quality when we first put them on your pipe. And in the hole, they *stay put.* They can work in high temperatures or in oil base drilling muds— take a powerful amount of wear and abuse. *They keep their grip.*

You get extra casing protection and extra performance from Guiberson protector rubbers because they're made from a special wear-resisting rubber compound, designed for universal application in all kinds of drilling. And you get it because Guiberson just plain *knows how* to mold and compound rubber products that can take the tough jobs in today's wells— and lick them.

That extra rubber know-how comes from Guiberson's long years of experience in manufacturing rubber products specifically for the oil industry. It comes from a rubber plant and laboratory staffed and equipped to do the specialized job right. When you want drill pipe protectors that won't walk and do maintain their original OD for a long, useful life, look to Guiberson for the answer.





FASTER ROUND TRIPS with New VHS Drilling Lines

• Faster round trips are just one of the advantages you get with rotary drilling lines of new LAY-SET VHS. Made of a new grade of steel for wire rope, new VHS is at least 15% stronger than Improved Plow Steel—the strongest available before VHS.

DRILL DEEPER

This extra strength allows you to drill deeper before increasing the number of parts of line. You can make faster round trips. And the extra strength of new LAY-SET VHS eliminates, in many cases, the necessity for buying new blocks or regrooving sheaves to use larger diameter lines for higher safety factors.

HIGHER SAFETY FACTOR

10 lines of new LAY-SET VHS have a safety factor of 14.9 or 15% higher than 10 lines of IPS. In fact, the safety factor for 10 lines of VHS is equal to that for 12 lines of IPS.

RESISTS ABRASION, PEENING

New VHS is also tougher. It has greater resistance to abrasion and higher resistance to peening—both important factors in maintaining shape and diameter. If regular adaptable cut-off practices are followed, ton-mile advantages should result.

WINCH LINES, TOO

Now winch lines of stronger, tougher VHS are also available. Call your Hazard distributor for rotary drilling lines or winch lines of new LAY-SET VHS. You don't need any complicated specifications—just tell him the size and diameter you want.

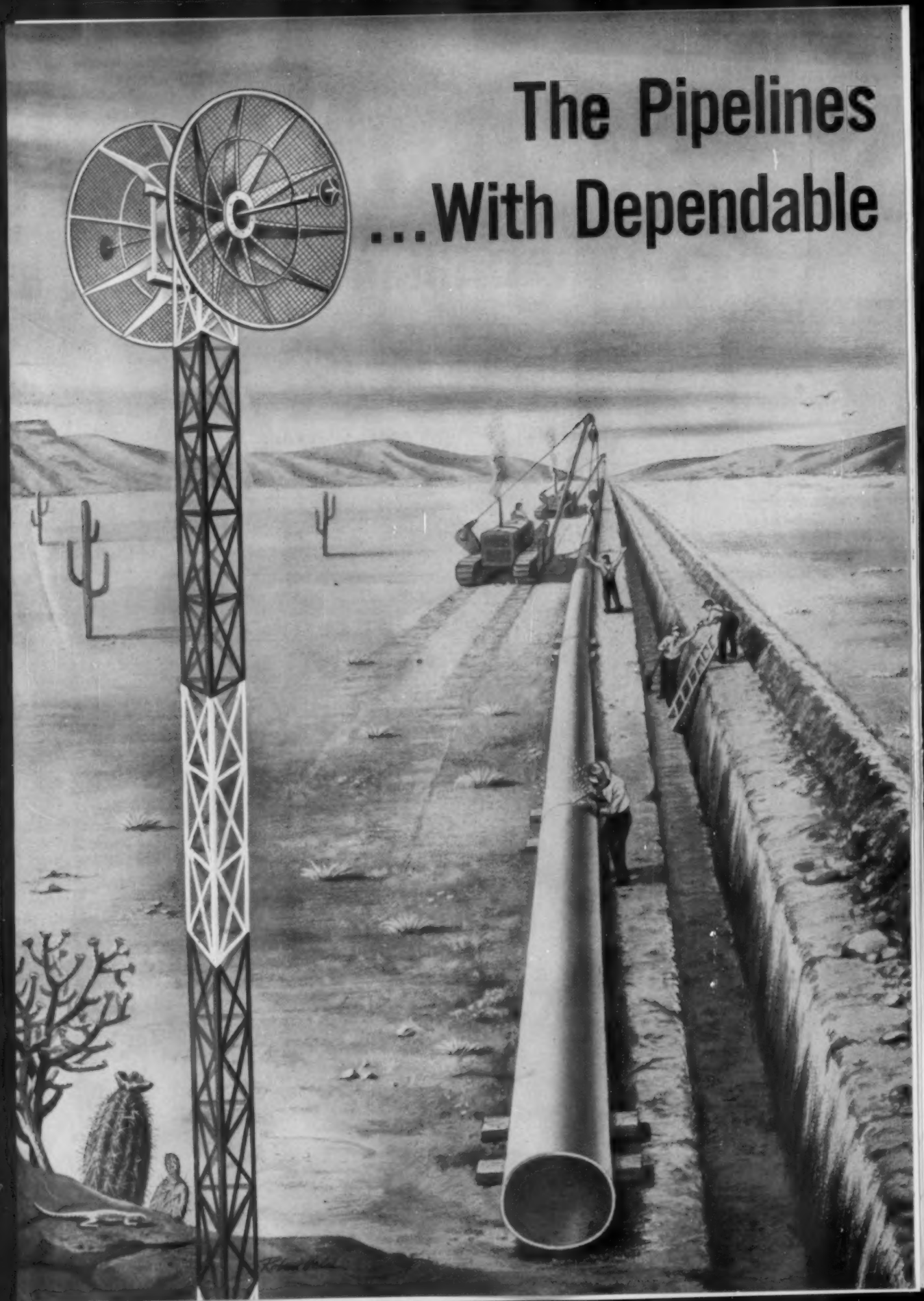
for further information write to the nearest Hazard office for Brochure DH-522

LAY-SET VHS 15% Stronger • Tougher •

HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.

630 McFarland St. Houston 1, Texas | 4555 E. 46th Ave. Denver 16, Colorado | 2216 S. Garfield Ave. Los Angeles 22, Calif. | 400 W. Madison St. Chicago 6, Ill.

Wilkes-Barre, Pa.; Odessa, Texas; New York, N. Y.; Philadelphia, Pa.; San Francisco, Calif.


The Pipelines
...With Dependable

Look to Remote Control
RCA MICROWAVE RADIO

A giant industry . . . already transporting trillions of feet of gas, billions of gallons of crude oil and products, in hundreds of miles of underground pipeline . . . is expanding its facilities to double . . . triple . . . quadruple its capacity! As the pipelines grow, they count on microwave radio relay to control operations. Today, the pipelines are the biggest private users of microwave.

Dependable RCA microwave provides multiple voice channels, assuring faster, less expensive service than leased lines; also circuits for telemetering, facsimile, fault reporting, supervisory control. Channel capacity (up to 90 channels), provided in the initial installation, gives the users "built-in" potential for adding remote control functions in the future.

IN UTILITIES—In the comparably great utility industry expansion, RCA Microwave Radio is providing vital communication functions, including voice, teletype, telemetering, supervisory control, load control, facsimile, remote control. High-speed tone usage also can be provided.

IN OFF-SHORE DRILLING—Microwave radio relay systems are now being installed in off-shore operations to provide communications for coordinating production and pipeline operations. Microwave has been selected because of crowded VHF radio conditions and because it easily provides facilities for such additional services as telemetering and equipment control.

COMPLETE SYSTEMS—including erection of towers, equipment housing, emergency power and construction of desired facilities—will be installed under supervision of specially trained engineers; can include circuits for mobile radio control. Nationwide services of RCA Service Company are provided to keep your system operating at its peak.

ON TURNPIKES—On the new superhighways RCA Microwave Radio provides dependable circuits for voice, facsimile, teletype, VHF control, traffic and business machine communications, giving operating personnel complete control, assuring greater road safety and service for patrons.

IN COMMON CARRIERS, AND AT WATERWORKS—The reliability and economy of RCA Microwave Radio make it ideal for telephone company applications. It is also gaining increased application as a communications medium for transmitting water level data to out-of-town water plants.

RCA MICROWAVE RADIO offers the most advanced engineering features. Techniques standardized and proved in 1700 to 2700 mc portion of spectrum; maintenance simplified by use of highly perfected UHF triode tubes, non-regulated power supplies; ease of field tuning through use of straight forward circuits and standard equipment units that are easily maintained. Single sideband frequency division multiplexing conserves frequency spectrum and gives assurance against obsolescence. Only two frequencies required. Provision for easy addition of future channels makes RCA Microwave the least expensive form of communications per channel mile.

RCA MICROWAVE . . . performance proved in more than a million channel miles of operating systems throughout the world.

Mail coupon for complete information.

RCA

Trade (s) ®

RADIO CORPORATION of AMERICA

COMMUNICATIONS PRODUCTS

CAMDEN, N. J.

RADIO CORPORATION OF AMERICA
Communications Products, Dept. RC-89
Building 15-1, Camden, N. J.

☐ Please send me latest literature on RCA Microwave for use in:_____

_____

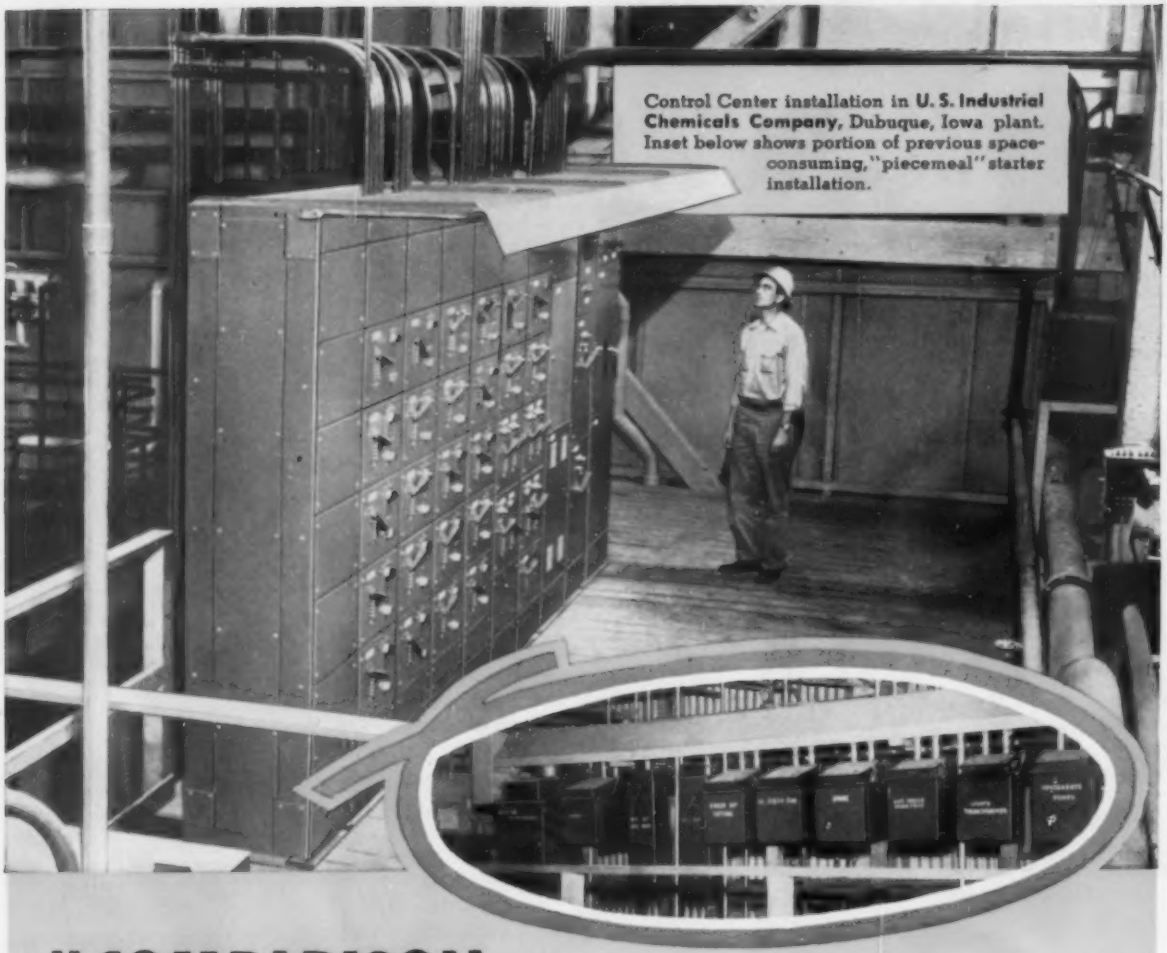
NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

☐ Have RCA representative get in touch with me.



Control Center installation in **U. S. Industrial Chemicals Company**, Dubuque, Iowa plant. Inset below shows portion of previous space-consuming, "piecemeal" starter installation.

"COMPARISON convinced us that a SQUARE D Control Center offered us MORE!"

These design features make Square D your logical choice, too...

INCREASED SAFETY because bus bars are fully enclosed, rigidly supported and have ample cross section. Circuits are isolated by individually enclosed plug-in units. Disconnect handle designed for maximum operator protection.

FLEXIBILITY. Individual plug-in units or complete sections are easily added, removed or exchanged. Pushbuttons, pilot lights, and selector switches are readily added to unit doors.

INSTALLATION ECONOMY. All wiring channels are large and accessible from front without removing units. No "wire fishing."

SPACE ECONOMY, TOO. Up to six combination starters fit in a 20" x 20" x 90" section. Plug-in unit heights designed in space-saving increments of 3 inches.

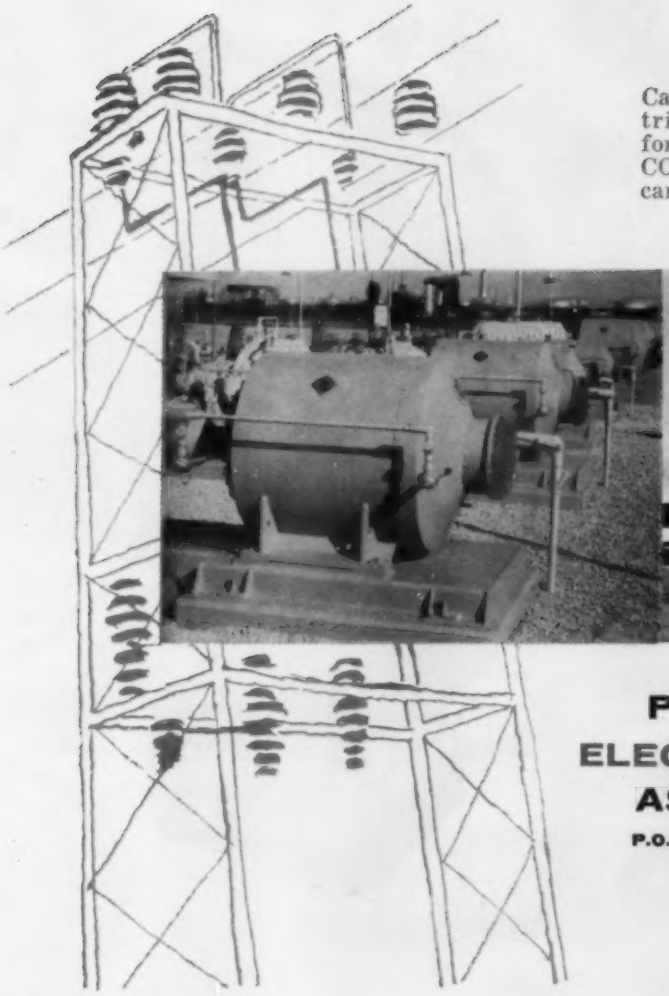
NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

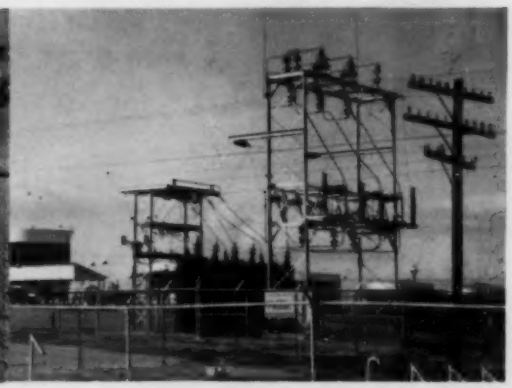
SQUARE D COMPANY

more than 350 pipeline stations are completely ELECTRIFIED...

WHY? Because Low Cost Purchased Electric Power handles the biggest jobs — pipe lines or multiple pumps — with trouble-free efficiency. Regardless of the job, Electric Power is your best bet. Operators of pipeline stations have found that for whatever the job... Electric Power gives them the advantages of low operating, maintenance, and labor costs... fast starting in all weather... and automatic control systems. Yes, with Electric Power... you get big savings.

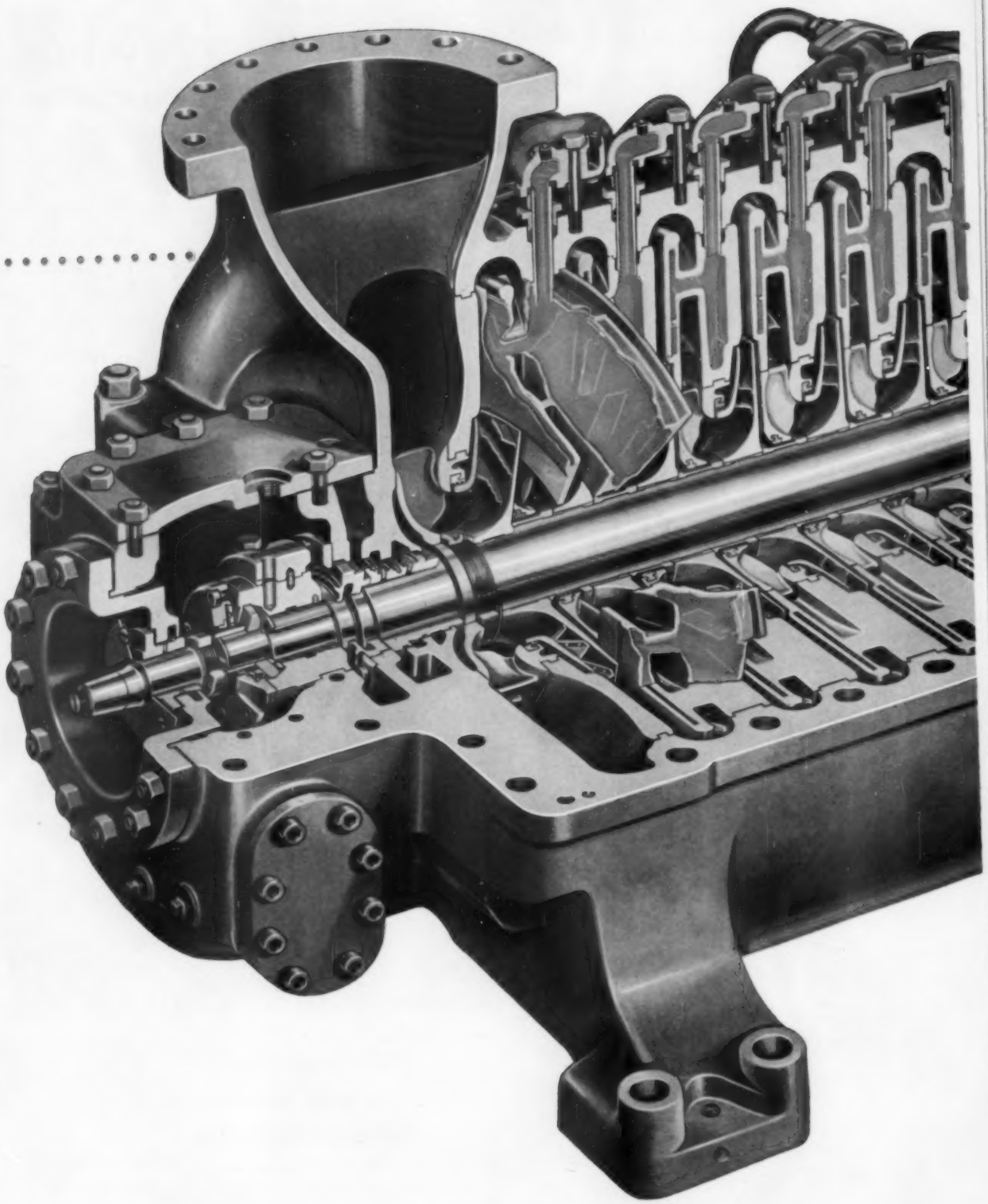
Call your nearest Electric Utility Company for facts on how LOW COST Electric Power can serve you.





PETROLEUM ELECTRIC POWER ASSOCIATION

P.O. Box 2771, Dallas, Texas



CLARK

Diaphragm Cooling

- Minimizes polymer formation
- Slashes horsepower requirements
- Greater safety handling hazardous gases
- Reduces capital investment

Clark double-wall diaphragm cooling is the simplest, safest, and most effective way to intercool a multi-stage centrifugal compressor. Furthermore, polymer formation is minimized in the compressing of unsaturated hydrocarbon gases by the use of diaphragm cooling. It is a simple, economical method of maintaining gas temperature at the desired level in the capacity range of 1,000-30,000 CFM.

Power savings are an additional benefit of diaphragm cooling. The savings range from 20% on 15 molecular weight vacuum gas compressing applications to 5% for 110 psig. air compressors. Reduced installation and operating costs result.

Minimum capital investment is realized another way. Applications involving high compression ratios such as gas recovery and 120 psig. or less air compressors can be handled in a single case.

Diaphragm cooling also assures maximum safety when compressing oxygen, acetylene, and other difficult gases. Internal surfaces are always cool. Danger from potential hot spots is highly remote.

Clark builds a complete line of multi-stage centrifugal compressors and in many instances a gas turbine to drive them. Your nearest Clark representative has all the facts.

CLARK BROS. CO. OLEAN, N. Y.

One of the Dresser Industries

Offices in Principal Cities Throughout the World

CLARK

Centrifugal Compressors

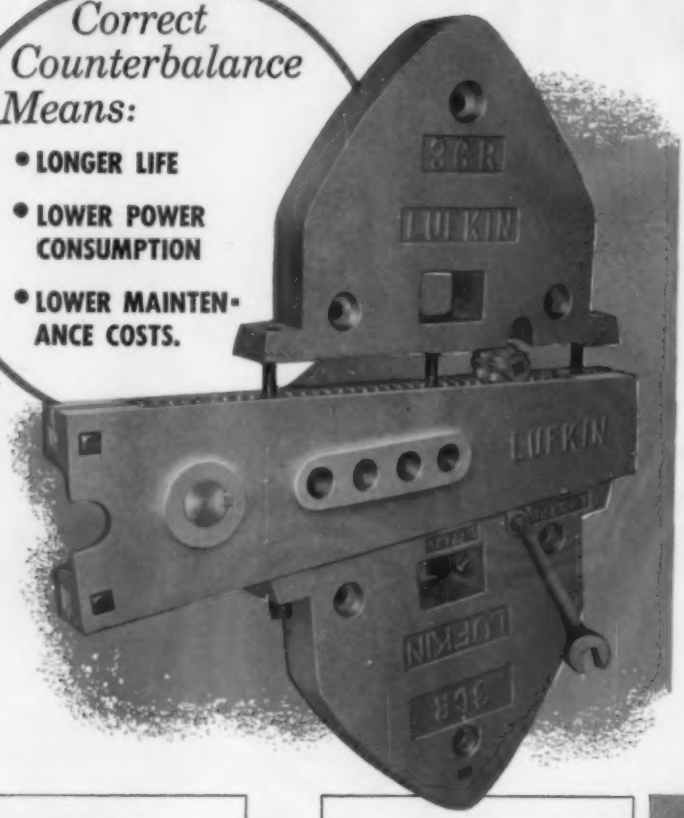
Gas Turbines

Correct Counterbalance is Essential to the Life and Performance of your Unit!

the LUFKIN-TROUT Crank

Correct Counterbalance Means:

- **LONGER LIFE**
- **LOWER POWER CONSUMPTION**
- **LOWER MAINTENANCE COSTS.**



Makes Counterbalance Adjustment Simple and Easy

1. Move cranks to horizontal position and set brake.
2. Loosen nuts holding counterweight using wrench as furnished and sledge hammer.
3. Loosen set screw with ordinary crescent wrench.
4. Insert square on wrench handle into socket in end of pinion and rotate, moving counterweight to desired position.
5. Tighten nuts on counterweight bolts, using wrench and sledge.
6. Tighten set screw.

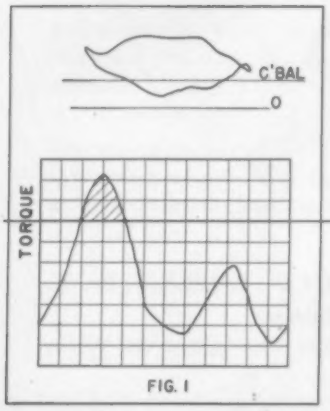


FIG. 1

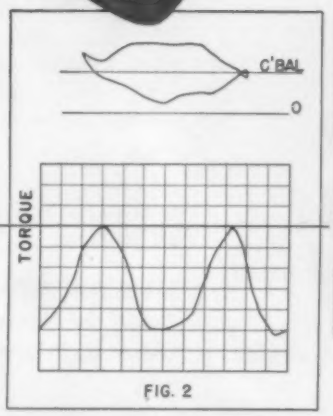


FIG. 2

FIGURE 1. Illustrates the results of incorrect counterbalance. Note peak torque on up stroke exceeds rating of gears.

FIGURE 2. Torque curve on same well shows how proper counterbalance evens out the peaks and reduces peak torque to within gear rating.

- Lufkin Gears, when operated within their rated capacity, will give many years of trouble free service.

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Lufkin equipment in Canada is handled by
THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada

He skipped the same 2 valves again today

Both are still in adjustment. Still no leaks, not even at the shank! Both are OIC plug valves. If he's curious enough to dismantle one, he'll see the OIC gland and O-ring construction that saves him time and cussing. It's different from other plug valves he's seen.

Three efficient seals prevent shank leakage on OIC plug valves. Concentric grooves machined into the gland liner form a "labyrinth" seal. The liner also retains an O-ring in contact with the plug's top face for a second positive seal. And resilient packing between gland and gland liner forms the third seal.

But the maintenance man measures design by *results*. OIC plug valves get his O. K. because they stay in adjustment a long time without leakage. However, if *you* are interested in the exclusive gland design and construction of these OIC plug valves, write for specification literature.

The Ohio Injector Company • Wadsworth, Ohio

OIC VALVES

FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES

Famous Wildcatter

Sometimes destiny (or a well-executed idea backed up by lots of hard work and determination to excel) plucks a company out of the crowd. It becomes known for succeeding where others overlooked an opportunity.

The man at the machine is a craftsman.

And why shouldn't he be called a wildcatter?

His "drilling" equipment in this instance consists of a huge drill press boring machine and he's digging through metal rather than the Devonian.

But, the machinist puts skill and imagination into machines like this and works unexplored areas to turn out new products that will help the oil industry produce petroleum more efficiently, more economically.

Sure, he's a wildcatter!

And, he's typical of the craftsmen associated with the Oil Center Tool Company — expert machinists who pride themselves on their ability to produce the best, the latest in oilfield equipment at the precise moment of need.

The oil industry isn't composed just of the geologist with the map, the man at the drilling controls, the integrated companies, the shoestring operators, the twinkling of derrick lights in the night, the screaming protests of drillpipe being coupled, the white smoke signals from a steam rig.

The oil industry is much more than this.

The Oil Center Tool Company machinist is a vital part of the industry, too.

For, of what avail would the designs of the scientists be if there were not craftsmen to transform the blueprints into usable products?

But, a man is a wildcatter for reasons other than just a situation.

To be a wildcatter, a man has to have a certain spirit.

That spirit defies precise definition.

Generally, however, it involves a desire to "be first."

That is what makes O-C-T craftsmen stand out—they have knowledge and equipment; but, coupled with that is a realization of the responsibility that is theirs and a resulting determination to be first with the best.

An O-C-T Christmas Tree doesn't stand hollowly alone.

There are many things in it.

Like the craftsmanship of O-C-T machinists, for example.

That's the strongest support you can have . . . for a Christmas tree or anything else.

O·C·T

OIL CENTER TOOL CO.

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

This O-C-T machinist is operating a radial drill press, one of a number of new types of equipment the company employs in its Houston plant. O-C-T machinists are craftsmen and they are a basic part of the company's strength.

Controlled Fissuring Power!

Welex BEAR GUN

(FORMATION FRACTURING TOOL)

The gun that shoots 'round a corner!

Welex called this mighty innovation the Formation Fracturing Tool when they developed and introduced it two years ago — you, in the field, gave it a new name after using it — the Bear Gun. By any name — oil operators everywhere are calling more and more for the tool's great fissuring power in their tough wells. Wherever the formation or a heavy invasion of mud or cement hinder the flow, call Welex for the Bear Gun. Each shot will give you a large entrance hole — deep into the formation — and the extensive fissuring that reduces pressures and makes your fracturing job a success!

Perforating is no sideline with WELEX!

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Welex JET SERVICES INC.

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WHEN YOU'RE LOOKING for exceptional toughness and durability in a finish for gasoline and oil storage tanks, you'll choose Pittsburgh's brilliant White TANKHIDE.

Here's a tough, long-lasting coating that saves you money in two important ways. Its special pigments and vehicles withstand corrosion and weather. Its high heat and light reflection reduce loss of tank contents caused by evaporation.

White TANKHIDE gives you one-coat hiding—can be brushed on when spraying is impractical. Its quick set and firmness of film during drying period prevent collection of dirt and insects, reduce damage from rain, scuffing and abrasion to a minimum. Self-cleaning action maintains its gleaming whiteness throughout its long life.

TANKHIDE is also available in synthetic gray and black as well as in gray and black oil-base finishes that can be used on metal or wood surfaces with equally good results.

Pittsburgh provides a wide variety of high quality finishes for every need in the petroleum industry. Our wide experience in this field often can save you valuable time and money. Write, wire or phone Pittsburgh Plate Glass Company, Industrial Paint Division, 1 Gateway Center, Pittsburgh, Pa.

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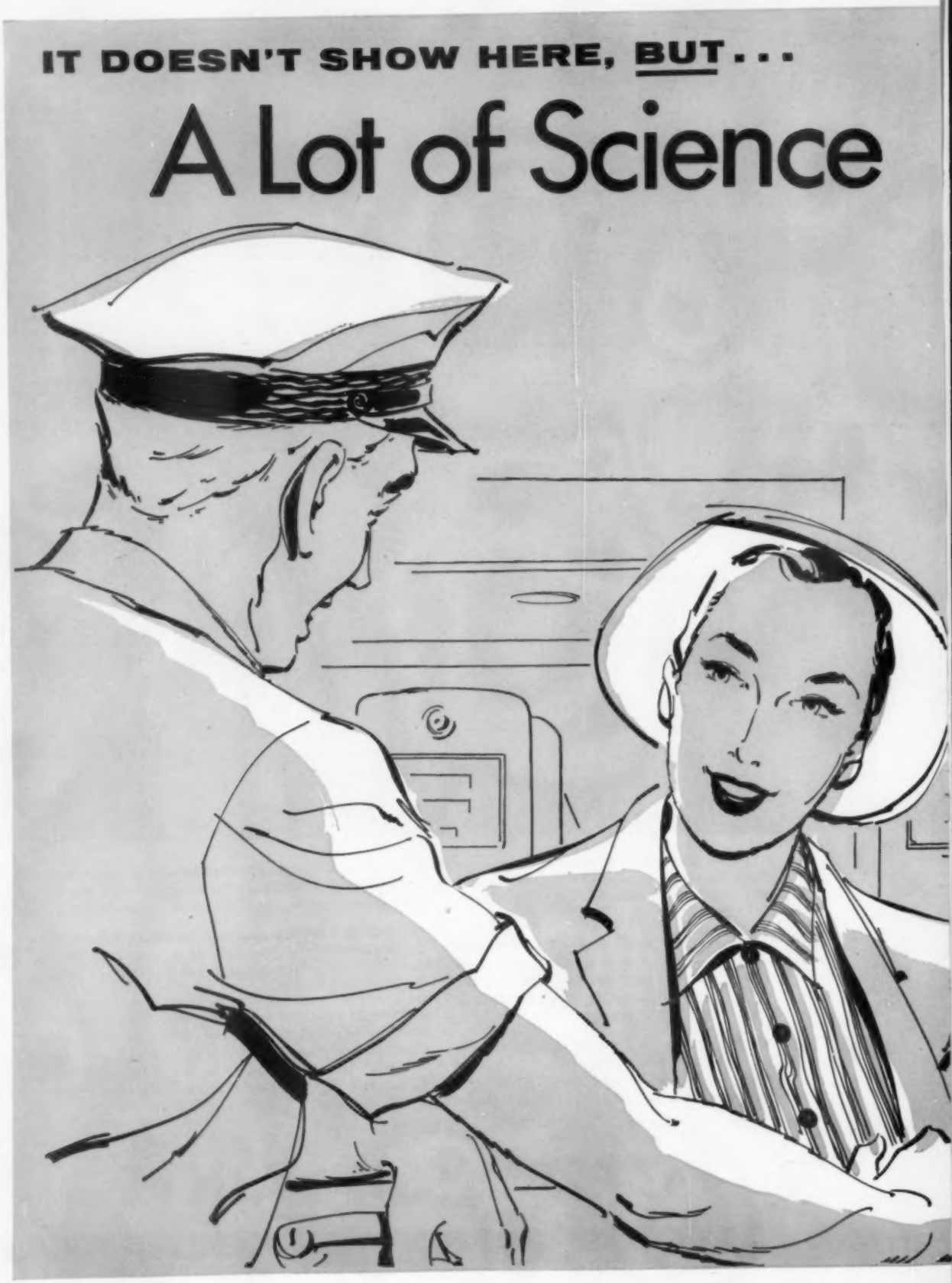
PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED


IT DOESN'T SHOW HERE, BUT . . .
A Lot of Science

Went Into This Sale!

Everybody in any phase of the petroleum business, production, research, manufacture, marketing, is strongly activated by one vital concern—the profitable sale of an end product to the ultimate consumer. And that's exactly what we are working toward, too.

As a research and development organization, UOP and its staff of scientists and engineers constantly apply their efforts and technical talents to the broad task of helping refiners provide the type of product that satisfactorily meets consumer needs at a reasonable cost.

For more than forty years, Universal-developed refining processes and techniques, available to refiners everywhere, have made a major contribution to the industry's ability to offer the motoring public the type of product it will and can buy.

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UOP **UNIVERSAL OIL PRODUCTS COMPANY**
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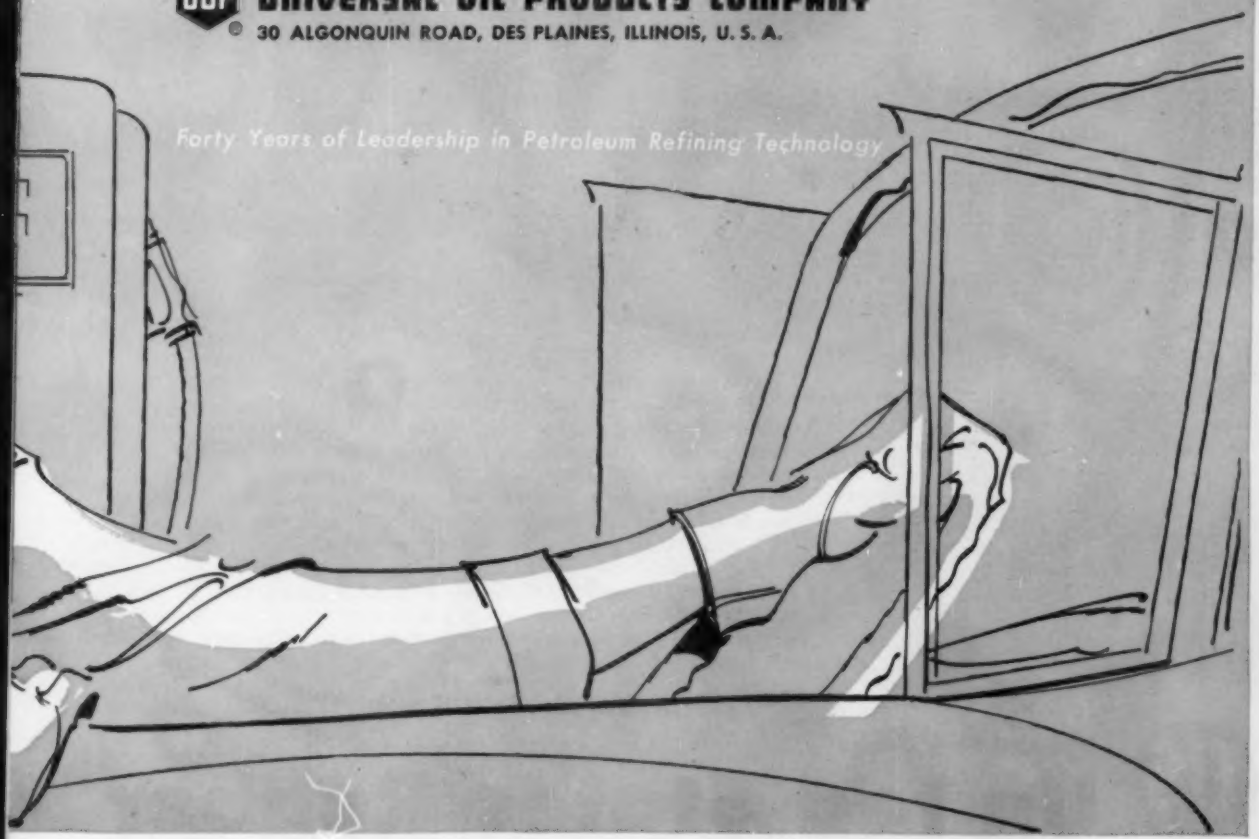
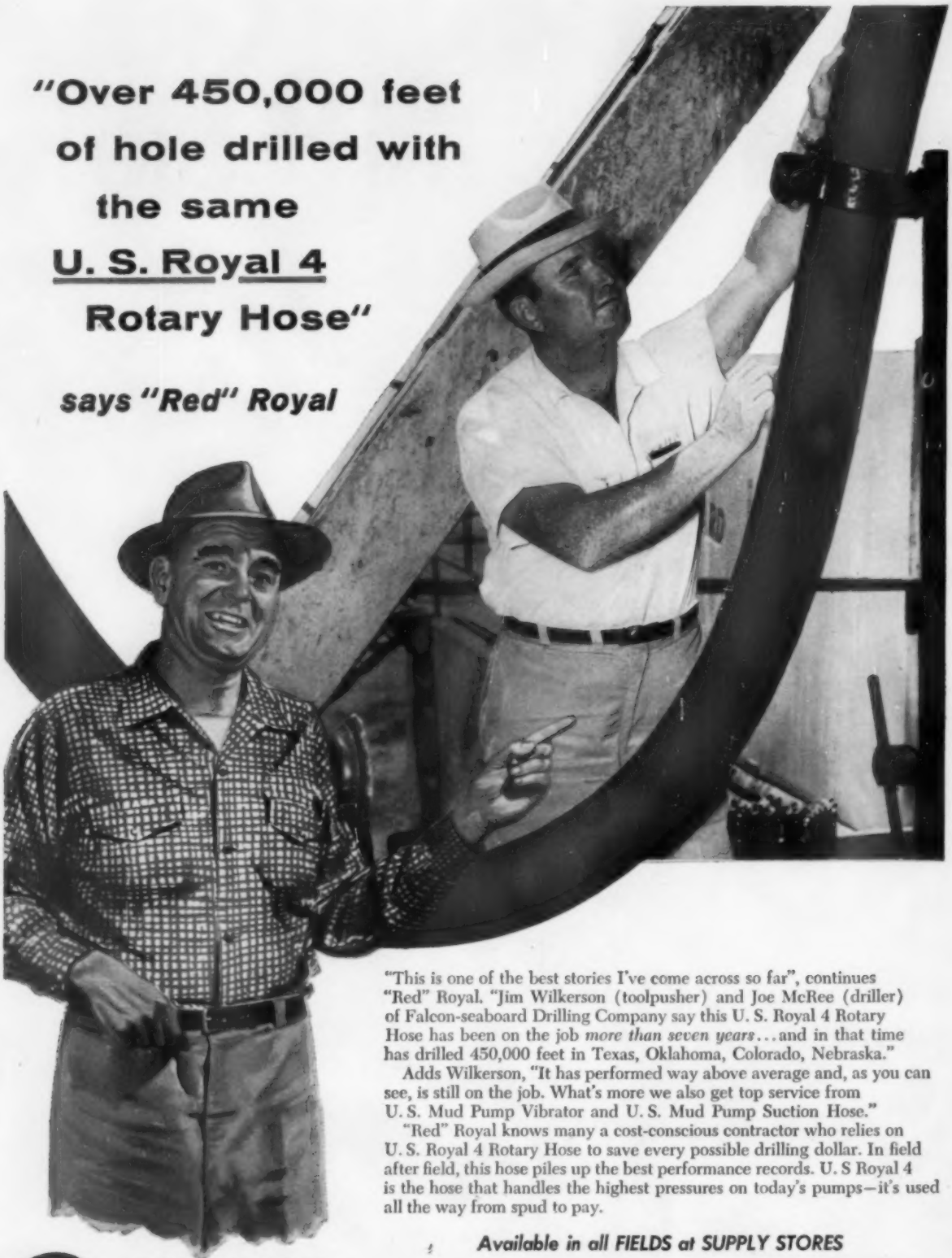
Forty Years of Leadership in Petroleum Refining Technology



"Over 450,000 feet of hole drilled with the same U. S. Royal 4 Rotary Hose"

says "Red" Royal



"This is one of the best stories I've come across so far", continues "Red" Royal. "Jim Wilkerson (toolpusher) and Joe McRee (driller) of Falcon-seaboard Drilling Company say this U. S. Royal 4 Rotary Hose has been on the job *more than seven years*... and in that time has drilled 450,000 feet in Texas, Oklahoma, Colorado, Nebraska."

Adds Wilkerson, "It has performed way above average and, as you can see, is still on the job. What's more we also get top service from U. S. Mud Pump Vibrator and U. S. Mud Pump Suction Hose."

"Red" Royal knows many a cost-conscious contractor who relies on U. S. Royal 4 Rotary Hose to save every possible drilling dollar. In field after field, this hose piles up the best performance records. U. S Royal 4 is the hose that handles the highest pressures on today's pumps—it's used all the way from spud to pay.

Available in all FIELDS at SUPPLY STORES

US RUBBER

Mechanical Goods Division

United States Rubber

RAYFLO
THE UNIVERSAL DISPERSANT

outperforms all other mud dispersants!

- **SAVES STARCH**—*Proved in Alberta, Canada!*
- **RESISTS SALT CONTAMINATION**—*Proved in Southeast Texas!*
- **EFFECTIVE IN LOW LIME MUDS**—*Proved at wells in Ventura, California area!*
- **HIGH TEMPERATURE STABILITY**—*Proved near Bakersfield, California!*
- **REQUIRES LESS CMC**—*Proved at offshore sites in Gulf of Mexico!*
- **EFFECTIVE WITHOUT CAUSTIC**—*Proved in Venezuela—where caustic is objectionable!*

Especially designed to control the viscosity and gel strength of drilling muds, this dark reddish-brown free-flowing powder (chemically a polyphenol derivative) offers unique advantages to contractors, tool pushers, well drillers and operators.

Rayflo resists salt, gypsum and cement contamination; controls properties of sea-water mud; and is an excellent oil emulsion stabilizer. It is completely uniform and fully effective even under conditions of low alkalinity.

Rayflo is made in the United States by Rayonier, a leading world producer of chemical cellulose, and in Canada by Rayonier's subsidiary, Alaska Pine & Cellulose Limited.

Rayflo cuts drilling costs effectively. Thoroughly laboratory tested, it's been proved over and over again in the field . . . and is accepted world-wide!

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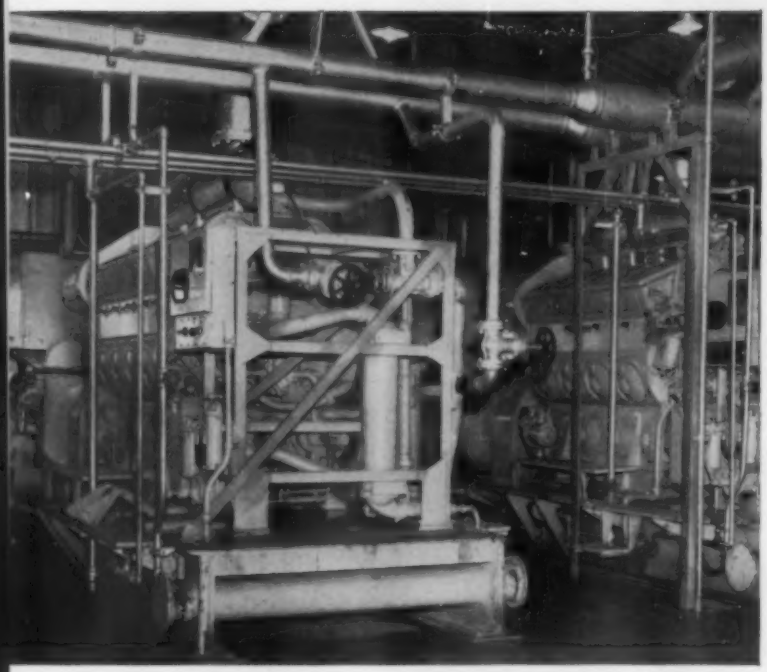
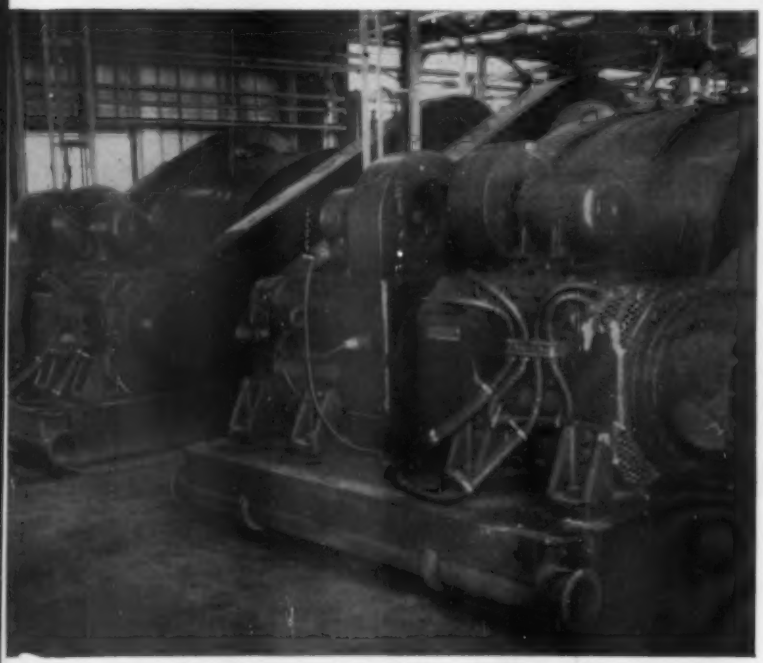
FIRST A TENDER — AND



Opposite the drilling platform on Rig 46 are three Electro-Motive 900-hp generating sets. Each of these 8-cylinder engines drives two 500-kw generators and comes complete on skids with air or water cooling, engine and generator controls. Kermac III, though radically different in design, uses the same standard Electro-Motive Power system.



Typical arrangement of Electro-Motive 625-hp dc drive motors with mud pumps is shown on Rig 46. Similar motors on the draw works are equipped with the new Super-Excitation control which provides a braking action when power is removed. In effect, the motor becomes a generator which slows smoothly and quickly yet retains all acceleration, torque characteristics and other power advantages of the series motor.

Towering mast on Rig 46 dwarfs men beside centrally-located driller's control that operates all Diesel-electric equipment. Called the tallest floating structure in the world, Rig 46 measures a whopping 268 feet from base to mast top. Sliding cantilevered drilling platform can drill six wells from one rig location. Overall area covered by the rig measures 242 by 202 feet.

NOW THE GIANTS

Pioneer Kermac fits new rigs 46 and 47 with ELECTRO-MOTIVE POWER

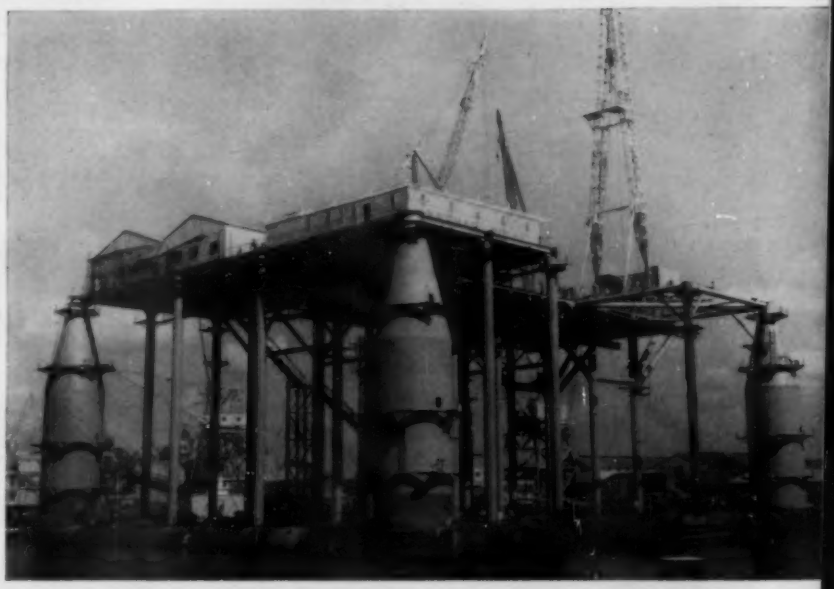
Kerr-McGee Oil Industries, Inc., was the first to operate a tender-platform with a complete Diesel-electric power system. The tender, Kermac III, working with Rig 48 in the West Delta Area has demonstrated its ability to make hole fast —recently drilled to 14,088 feet in 67 days.

Kermac III is powered by two Electro-Motive 900-hp generating units that team with a third on Rig 48 to power electric drive motors on draw works, rotary and mud pumps.

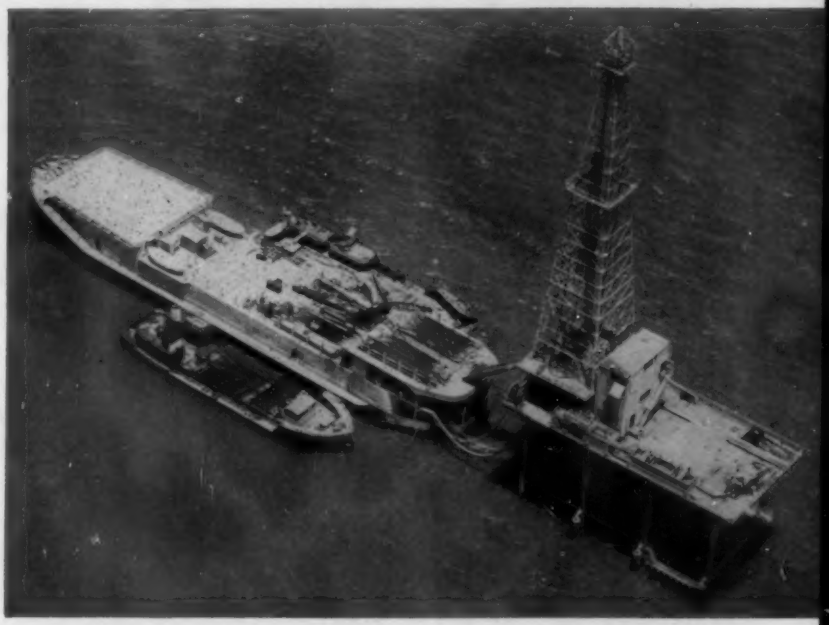
Kermac's new giants—Rigs 46 and 47—are of radically new design, yet their power is the same as that for Kermac III and Rig 48. The reason? Flexible electric cables between generating units and drive motors permit complete freedom of power arrangement. Thus, rigs can be designed to requirements without restrictions due to alignment.

Power to make hole fast; flexible to meet varying drilling conditions; simple, accurate controls; matched components, designed and built by one manufacturer—these are reasons why more offshore rigs use Electro-Motive Power than any other Diesel-electric drilling system.

Both land and offshore rigs are successfully reducing drilling time and costs with Electro-Motive Power. See or call your Electro-Motive representative for complete information.



Kermac Rig 46 is a new type of giant mobile barge capable of drilling in 70 feet of water. Rig 47, recently launched, is of identical design.



Kermac Tender III and Rig 48—first tender platform to have a complete Diesel-electric power system.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
LA GRANGE, ILLINOIS

In Canada: General Motors Diesel Limited, London, Ontario

Petroleum industry sales offices: Tulsa, Oklahoma; Houston, Texas; Dallas, Texas; Morgan City, Louisiana; Pasadena, California.

End uncertainty in getting the longest tube life per dollar:

... *ask the experts!*

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Suggested as a subsitute for steels of the 5.0 per cent chromium type for applications which require increased resistance to corrosion by hot petroleum products.

23 TIMKEN® STEELS FOR HIGH TEMPERATURE SERVICE

Carbon	Sicromo 2	Sicromo 5S	16-13-3
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	25-20
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-12
Silmo	Sicromo 3	Sicromo 9M	35-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti	18-8 Cb	

*Not available as seamless tubing at the present time.

WHATEVER your high-temperature steel problems—heat, pressure, corrosion, oxidation—there's always one tube steel among the Timken Company's 24 different high-temperature analyses that will do the best job. One that will give you the maximum service per dollar and cost per year of required service—the best life/cost ratio.

To find this *one*, right analysis, *ask the experts!*—the metallurgists of The Timken Roller Bearing Company.

These experts are recognized authorities on high-temperature steels, have been for over twenty years. And they're ready to put their experience to work for you. They'll study your particular requirements, recommend the one tube steel to most satisfactorily and economically meet them. Result: you get the longest tube life per dollar.

And you can be assured of uniform high quality in the Timken® steel you get. For the Timken Company controls and guards steel quality from the furnace to final inspection.

Call on Timken Company metallurgists for understanding help in solving your tube steel problems. End uncertainty. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

General view of the Timken Company metallographic laboratory where many analyses of steels are viewed under high-power microscopes.

TIMKEN *Fine Alloy* STEEL

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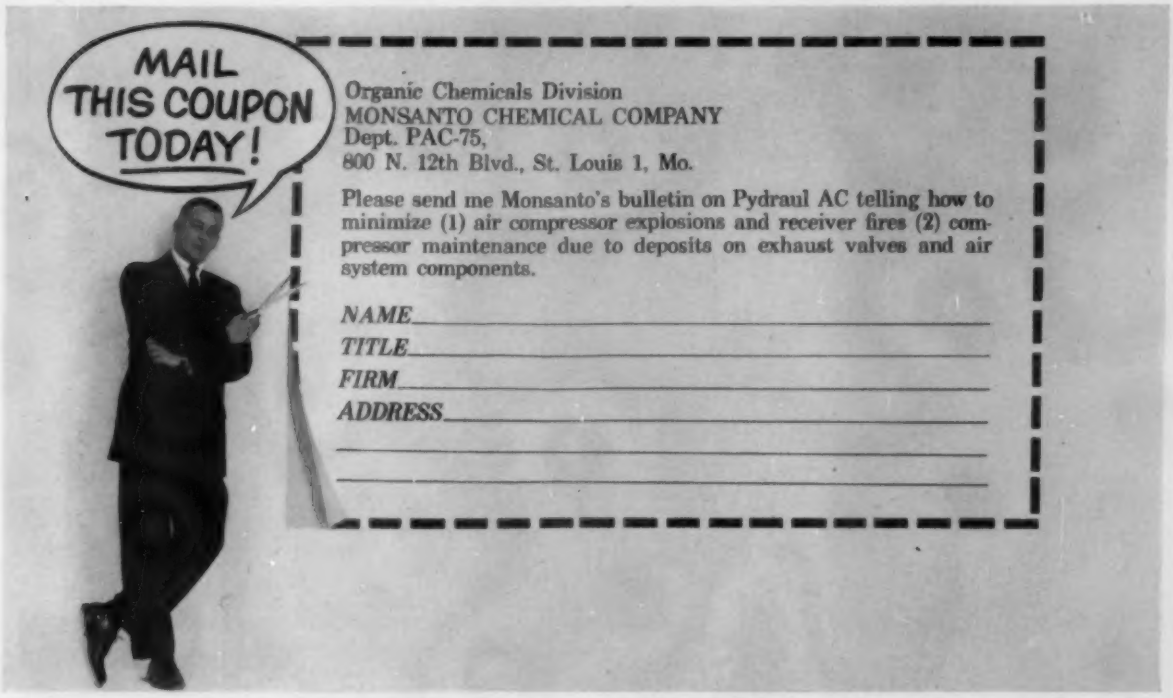
SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING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Please send me Monsanto's bulletin on Pydraul AC telling how to minimize (1) air compressor explosions and receiver fires (2) compressor maintenance due to deposits on exhaust valves and air system components.
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Want to reduce fire hazard in your air compressors?... Read Monsanto's bulletin on Pydraul AC

When flammable oil mists and films gather in your compressed air system... you have a real fire risk!

Ease your mind—there's a new, fire-resistant lubricant to protect your equipment, your workers and your production flow from compressor fires and explosions caused by flammable oils. Simply replace your ordinary petroleum oils with fire-resistant Pydraul AC compressor lubricant.

Pydraul AC is chemically made, not a water-soap base mixture, not a petroleum oil. It's a completely new type of bearing-protecting lubricant. Pydraul AC is created especially for air compressors. With Pydraul AC lubrication you ease your mind about compressor fires and explosions. You may also reduce maintenance costs because Pydraul AC can minimize carbon deposits on air compressor exhaust valves and air piping systems.

There's no conversion problem—just drain out the flammable lubricant and replace with fire-resistant Pydraul AC—it's that easy!

For more facts—fast: Just mail the coupon today for the new Monsanto bulletin on Pydraul AC. No cost to you. It shows properties, field experience, operating economies, etc. Act *now.* Mail coupon *today!*

There's also a fire-resistant Pydraul for every industrial hydraulic job:

- General-purpose Pydraul F-9
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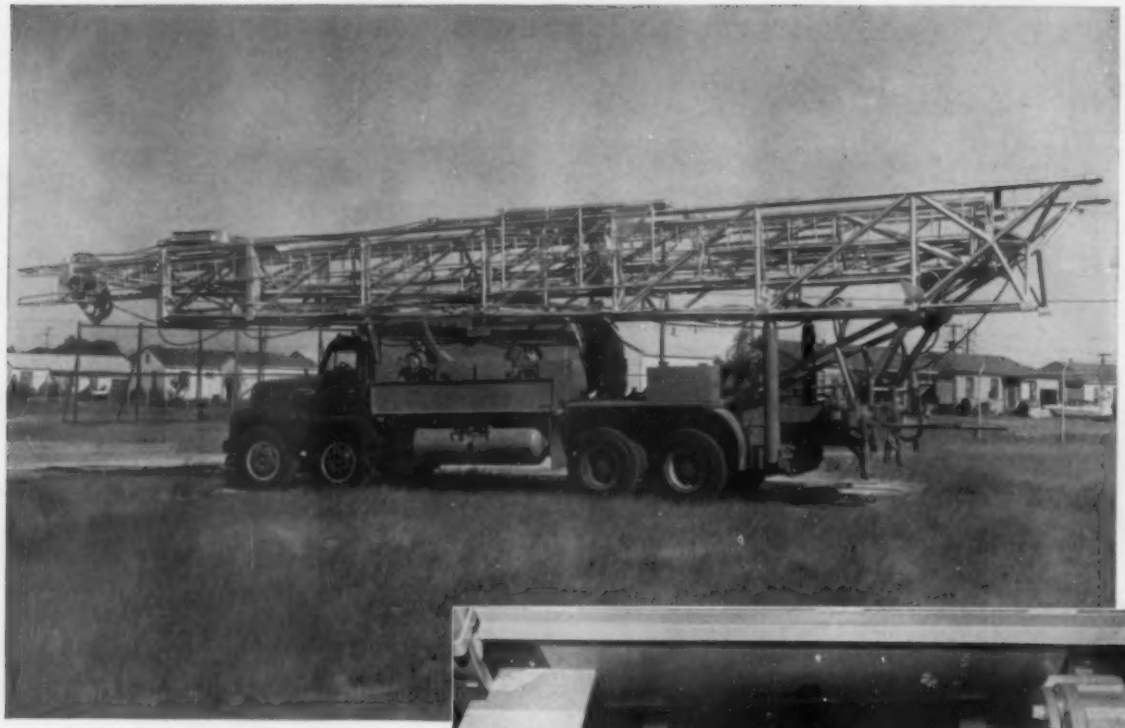

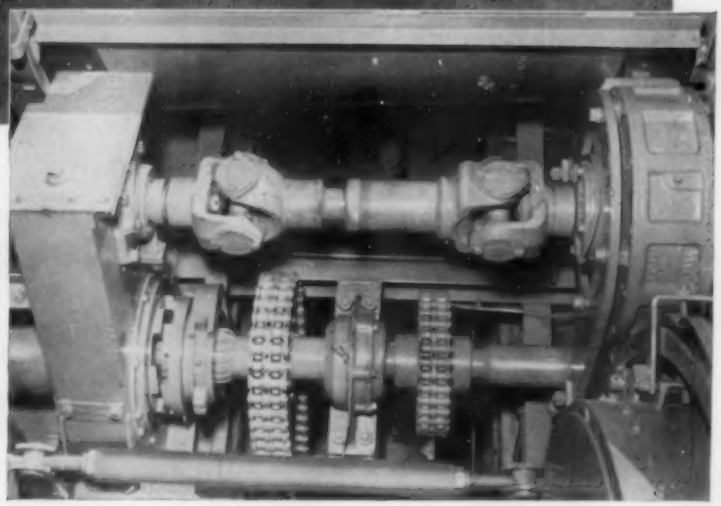

Driving the draw-works—
Rex Roller Chain.

REX®

Roller chain on the Franks Rocket Rig

Have a look inside this Franks Rocket Rig (Franks Division, Cabot Shops, Inc., Drawer 3216, Whittier Station, Tulsa). You'll see Rex Roller Chain driving its draw-works.

Why Rex? Rex pitch control assures equal load distribution over all parts—and greatly extended chain life. Rex manufacturing has added tremendous strength at the pin holes. Rex glide-fit design makes assembly and disassembly fast and easy.

Why Rex? It's the very best of all the good roller chains—best design, best materials, best manufacture to the precision tolerances needed to keep your rig running around the clock.

CHAIN Belt Company, 4619 West Greenfield Avenue, Milwaukee 1, Wisconsin.

CHAIN BELT COMPANY

Milwaukee 1, Wisconsin

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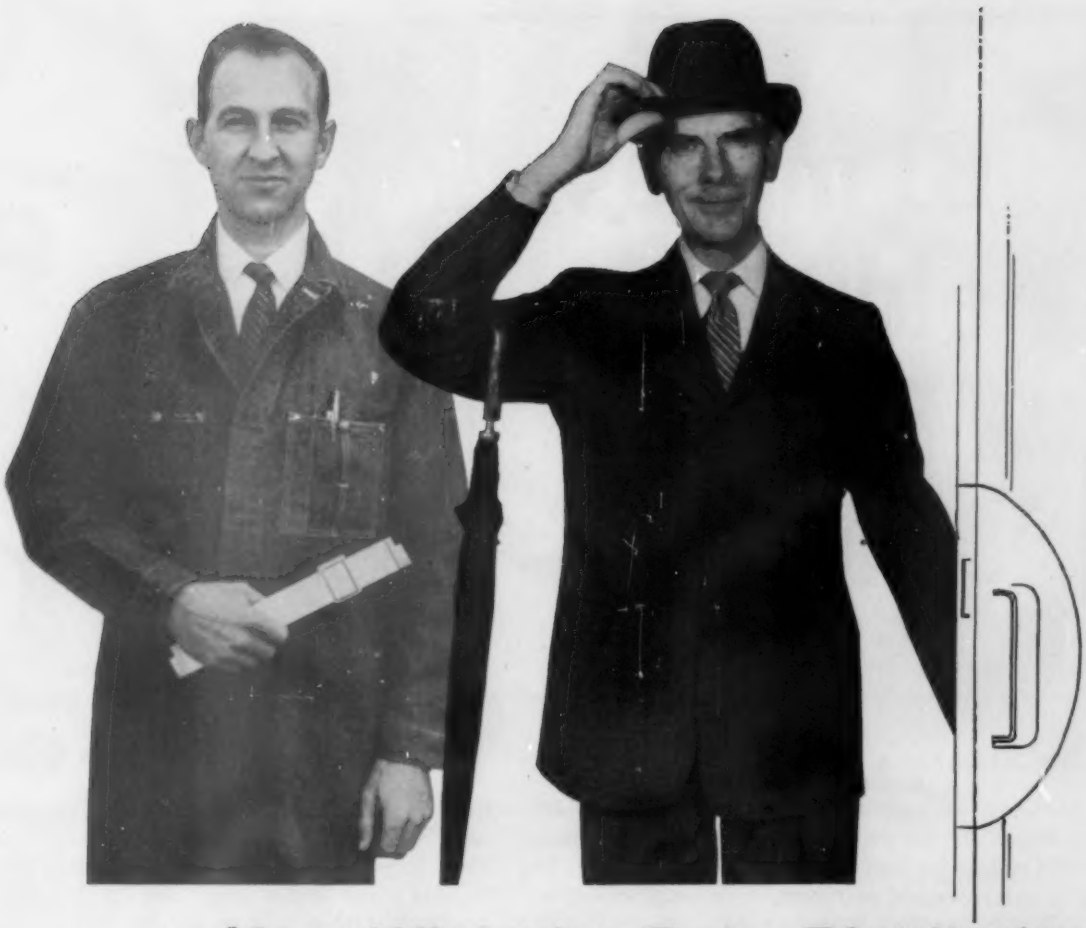


Your Wickwire Rope Distributor and our sales engineer ... a helpful team

This sales engineer—an expert on the selection, installation and maintenance of our products—is with your Wickwire Rope Distributor every time he makes a call.

True, sometimes he's hundreds of miles away, working in the field or at the mill. Yet, even if he's not there in person, your Wickwire Distributor has the full assurance that sales engineers such as this one are *always* quickly available to help you.

It's just one more reason why your Wickwire Distributor knows he's got top-quality wire rope, slings and strand to sell ... and that these products will serve you well.

4086

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

BJ makes old tongs factory new!

Available to you immediately from the BJ tong pool

The longer you keep those old worn-out tongs, the more inefficient and dangerous they become. But don't throw them in the scrap heap, they're worth money to you. You can trade in your old unsafe tongs for a factory-rebuilt pair without losing a single hour of service.

Through Byron Jackson's tong pool, you will receive a set of tongs that have been rebuilt to BJ's original manufacturing specifications. These tongs have been magnetic-particle tested for invisible flaws. Repairs are made with strict adherence to national welding specifications by BJ's factory-trained experts. Modern precision machines, specially designed for tong manufacture and repair, are used. These tongs are re-heat-treated to the same specs as a brand-new tool. Special gauges and test fixtures are used to reproduce the original fits and tolerances.

Don't gamble with makeshift field repairs or welding that weakens the heat-treated strength of your tongs. Play it safe; trade them in for a like-new pair from Byron Jackson's factory-rebuilt tong pool.

Byron Jackson Tools, Inc.
A Subsidiary of Borg-Warner Corporation
P. O. Box 2017A Terminal Annex, Los Angeles 54, California

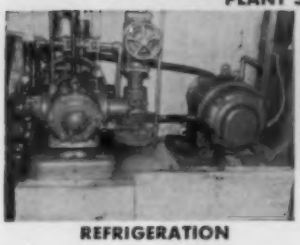
WATCH BJ FOR THE NEWEST

All parts are magnetic-particle inspected for hidden flaws before repair is begun.

Tong parts are reheat-treated in electric furnaces to restore their original hardness.

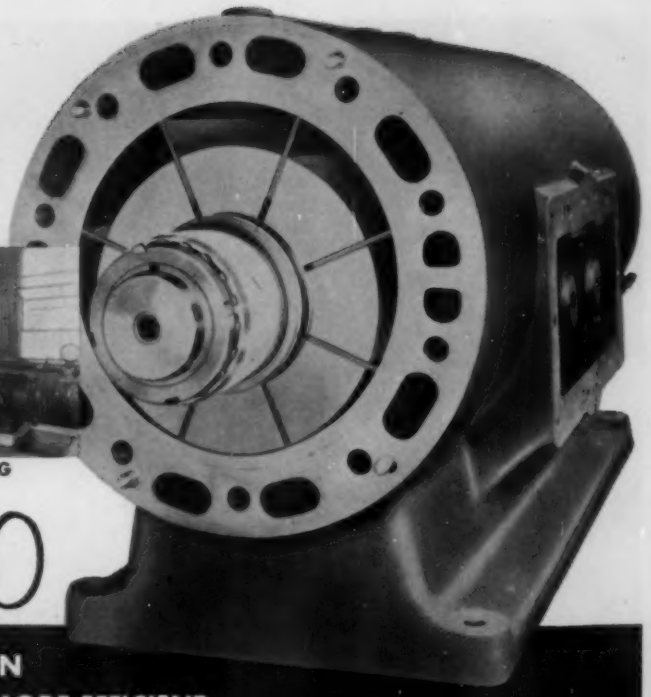
Repaired tools are given final inspection on test stands to determine performance.

PLANT SERVICES



REFRIGERATION

GAS GATHERING

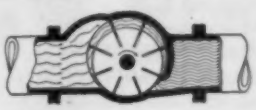


Since 1930

. . . FULLER ROTARY MOTION has been the key to SMOOTHER, MORE EFFICIENT, LOWER COST AIR COMPRESSION

The unique revolving principle pioneered by Fuller is the heart of the Fuller Rotary Compressor—both single- and two-stage types—and provides impressive cost, maintenance and operating advantages.

Simplified Fuller design consists essentially of a rotor eccentrically mounted in a cylinder to form a crescent divided into sections by the rotor blades. Each section or pocket carries air from one end of the crescent to the other without reversal of flow and with measurable improvement in volumetric efficiency. The rotor blades move freely by centrifugal force alone and compensate automatically for wear. As a result, Fuller Rotaries can operate indefinitely without care and the occasional inspection check required can be made with fewer men and in far less time.



COST-SAVING ADVANTAGES

1. Smooth, pulse-free, one-way air flow
2. Almost complete lack of vibration permits use of light foundation
3. Far fewer moving parts insure low maintenance
4. Small size for high capacity permits installation in minimum space
5. Direct drive further reduces space requirements
6. Valveless design permits continuous, unsupervised operation and greatly reduces maintenance

Fuller Rotary Compressors:

- Maintain original capacity for the life of the machine
- Provide a high degree of reliability, thereby reducing standby capacity requirements
- Have few moving parts, thus sharply reducing parts inventory
- Require minimum supervision and inspection

It will pay you to compare Fuller Rotaries with other compressors and evaluate Fuller advantages to your operation in terms of annual net savings. Fuller Rotaries are available for industrial pressures to 125 psig and capacities to 3300 cfm. We will be glad to supply you with facts based on actual experience with Fuller installations over the past 25 years.

Clip, fill in and mail the coupon for detailed information about Fuller Rotary Compressors for plant services, refrigeration or gas gathering.

FULLER COMPANY
132 Bridge St., Catasauqua, Pa.
A SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORP.
Chicago • San Francisco • Los Angeles • Seattle • Kansas City • Birmingham

Visit Us In Booth 717 At the National Materials Handling Exposition, Philadelphia, April 29 to May 3.

Fuller
pioneers in harnessing AIR

C-285
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FULLER COMPANY
132 Bridge St. Catasauqua, Pa.

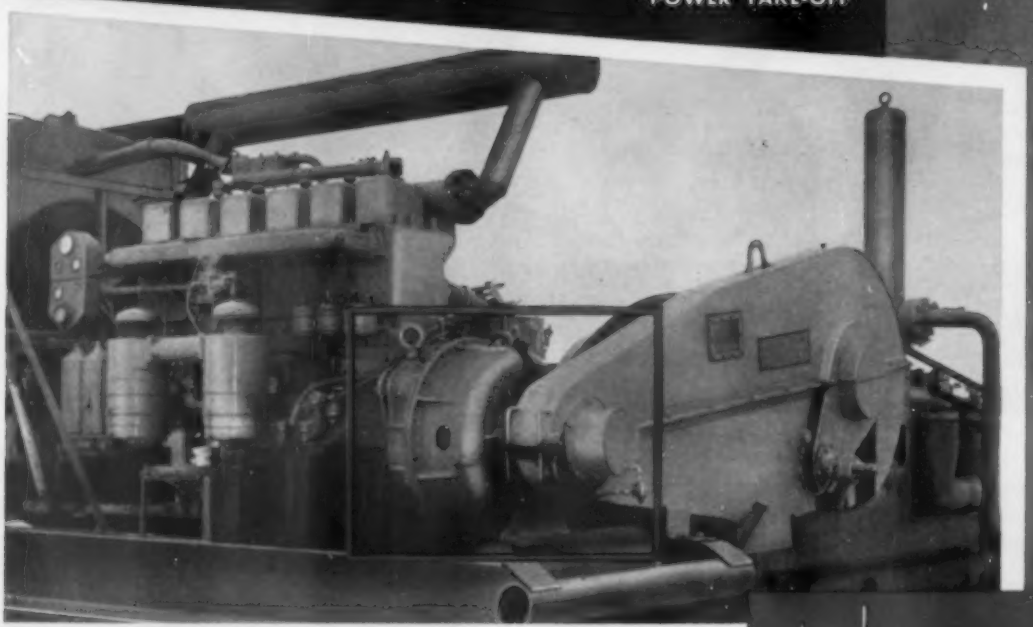
Please send me, without obligation, descriptive literature on the Fuller Rotary Compressor. I am specifically interested in a pressure of _____psig and a capacity of _____cfm, to be used for:

NAME_____ ☐ Plant Services
TITLE_____ ☐ Refrigeration
CO. NAME_____ ☐ Gas Gathering
STREET ADDRESS_____
CITY_____ ZONE_____ STATE_____

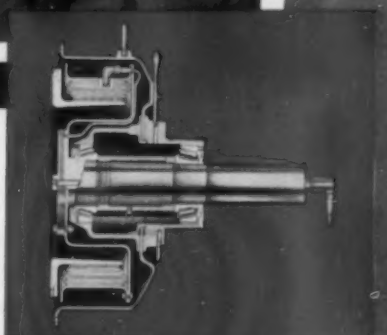
Air Controlled Shock-Free Operation with FAWICK PTO*

*POWER TAKE-OFF

Another Field-Proved Product Supplied by Mid-Continent



The air operated Fawick Power Take-Off provides an ideal shock-free independent pump drive and may be remotely controlled from the driller's position. Heavy duty bearings and rugged bell housing eliminate the need for pilot bearing or outboard bearing. The Fawick PTO offers dollar savings in initial installation too, because it requires no special adapters, skids or outboard bearings. It bolts directly to the engine flywheel and flywheel housing. V-belt or chain drives are easily installed or removed from the open end clutch shaft, speeding up rig-up time. For complete information on the Fawick PTO, contact your Mid-Continent representative. Mid-Continent stores, sales offices and sales representatives are located in all active oil areas.



Air operated Fawick PTO has self-adjusting CB air-flex clutch and rugged anti-friction shaft bearings.

PESA

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MID-CONTINENT Supply Company

MID-CONTINENT BLDG. • FORT WORTH, TEXAS

Export Division: 45 Rockefeller Plaza, New York 20, N. Y.; Cable: Midcumport NYK

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

"It'll pay us to replace it with an ALDRICH PUMP!"

Downtime, due to pump failure, is always a costly item. It takes the reliability and freedom from maintenance found in an Aldrich Pump to eliminate downtime under continuous, heavy duty pumping operations. Top performance under these conditions has earned Aldrich its reputation for building pumps of highest quality and dependability.

The tougher the job . . . the more important it becomes to take advantage of our wide experience in providing the petroleum industry with pumps for water flood, pipeline, gasoline plant, hydrocarbon injection or petrochemical service.

In the less critical jobs, too . . . it makes sense to call Aldrich. The simplicity of the Aldrich Direct Flow design, with fluid-end sectionalization, offers substantial economies in both operation and maintenance.

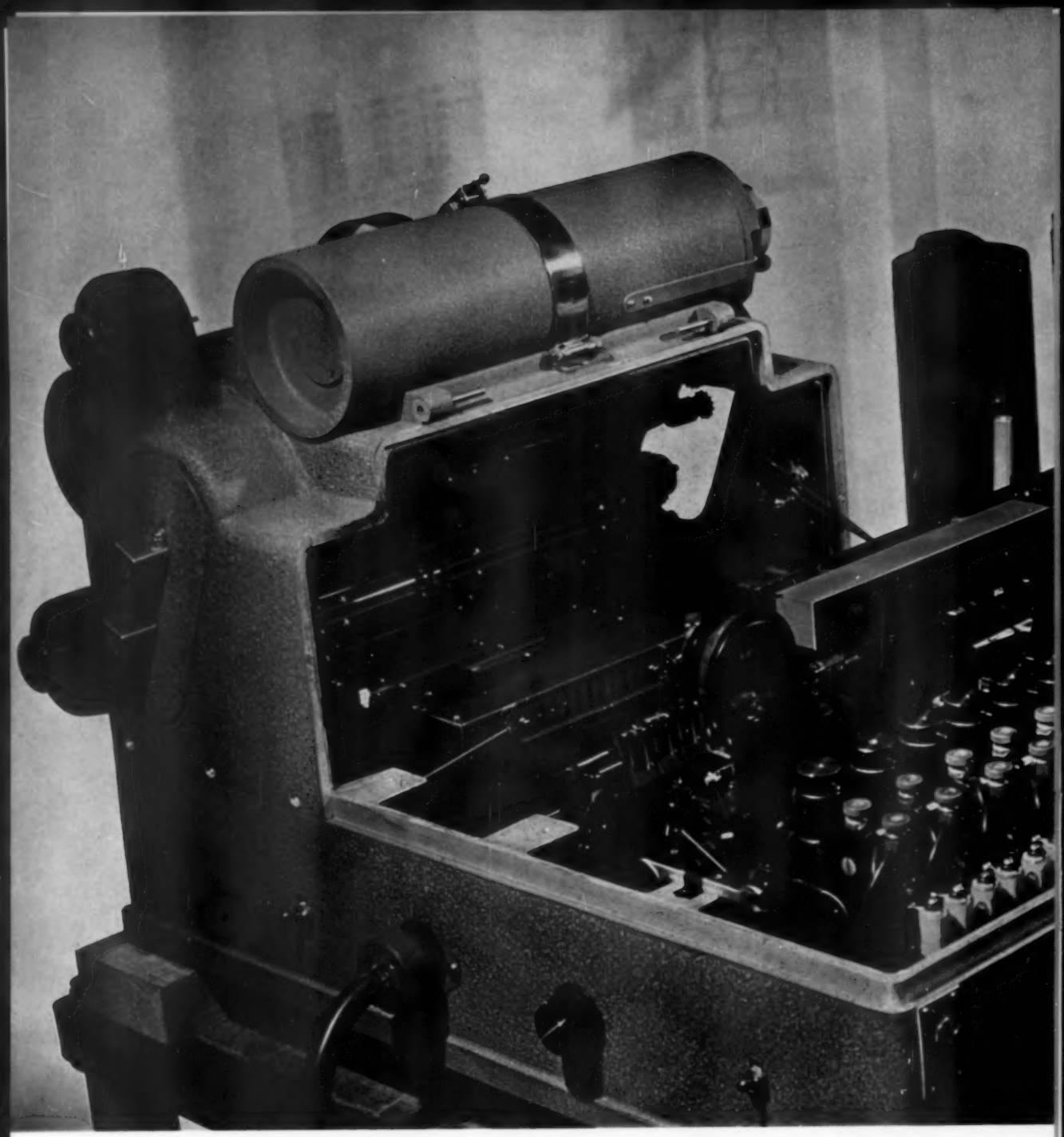
A copy of our new condensed catalog, showing the line of Aldrich Pumps is yours for the asking. Write for Data Sheet 100. The Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.

Shown above is one of a number of Aldrich 5" stroke, Triplex Pumps installed at a major west coast water injection project. These pumps are currently handling 35,000 bbl daily at injection pressures of 1,000 psi.

THE

ALDRICH

PUMP COMPANY



It can see 24,000 feet straight down!

There had never been an instrument like this in the world . . . until Schlumberger engineers produced it.

It is the master key to successful exploration.

The Schlumberger Automatic Recorder fulfills all the requirements for accurate, simultaneous recording of several curves, plus two depth scales.

It records all down-the-hole logging services on film for immediate study in the field. It produces all recorded data in the original true form.

Schlumberger quality can be obtained only with Schlumberger instruments. When you call Schlumberger, you are assured the best service and most dependable results obtainable.

THE EYES OF THE OIL INDUSTRY

SCHLUMBERGER

WELL SURVEYING CORPORATION

"A vital need for an expanding world economy is that kind of integrity in governments which encourages confidence... governments that are consistent, reliable, and responsive, not only in their dealings with their own citizens, but in dealings with each other and with each other's citizens."

—Eugene Holman, Chairman of the Board, Standard Oil Company (New Jersey)

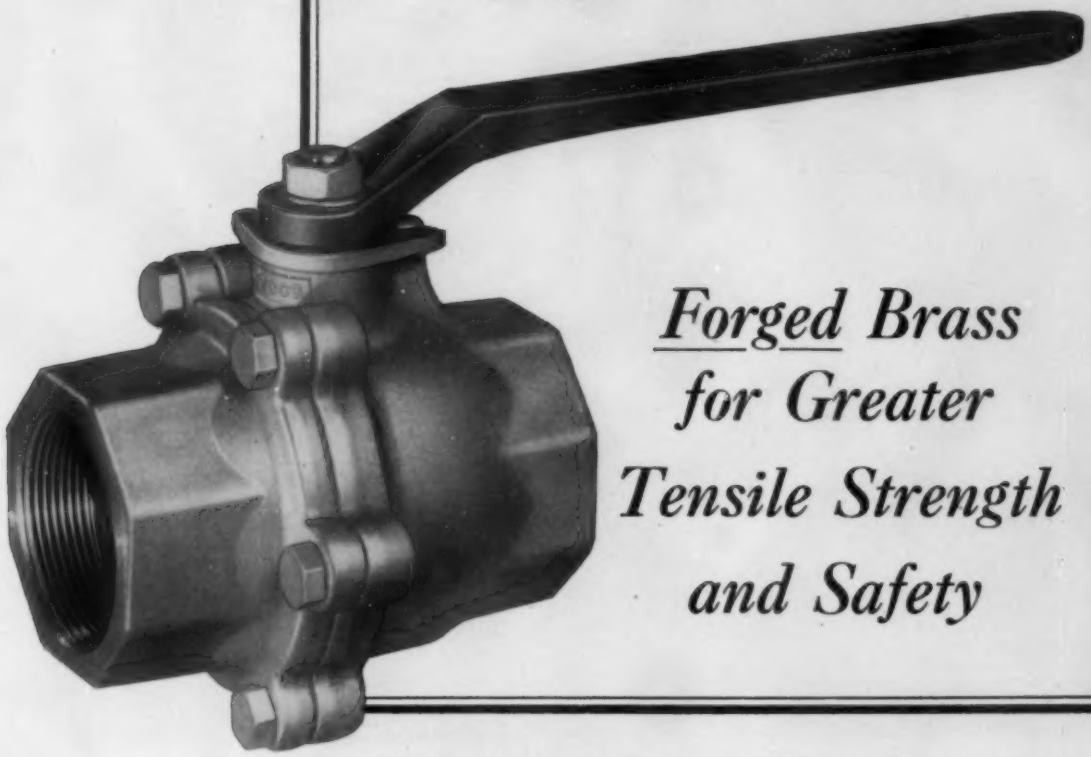
Esso 75 YEARS

producing energy for an abundant life

STANDARD OIL COMPANY (NEW JERSEY)

AND AFFILIATED COMPANIES

NEW Rockwood Ball Valves



Forged Brass for Greater Tensile Strength and Safety

Here's another Advantage — Full, Round Flow!

The new Rockwood Forged Brass Ball Valve assures you of Full, Round Flow — you get fast, efficient operation (¼ turn opens or closes valve) and less friction loss. The handle can be attached in any of 8 different positions for greatest convenience.

And another Advantage — Leakproof!

In closed position the pressure of fluid in the Rockwood Forged Ball Valve *automatically* positions ball against the synthetic rubber seat to form a tight, leakproof seal. There are several seat materials available for different applications.

And still another Big Advantage — Longer Wear!

The brass ball in the Rockwood Forged Valve is chrome-plated to stand up under abrasion, pitting, scratching.

Rockwood's new Forged Brass Ball Valve gives you trouble-free service. That means longer time between replacements . . . less maintenance on the job — more for your money in every way.

You can get this new valve in all pipe sizes. Tested and listed by Underwriters' Laboratories, Inc. Mail the coupon now for complete information.

ROCKWOOD BALL VALVES

FULL, ROUND FLOW

ROCKWOOD

ROCKWOOD SPRINKLER COMPANY
1271 Harlow Street
Worcester 5, Mass.

Send me illustrated folder on Rockwood Full, Round Flow Ball Valves.

Name.....

Title.....

Company.....

Street.....

City.....*Zone*..*State*.....

Anaconda Type CP Cable is laid in trench to oil well casing to be protected by cathodic protection. Continental's entire 163-well lease at Ventura, Calif., has been protected with a CP system.

Oil company checks oil well casing corrosion for less than the cost of 3 casing failures—with CP

Anaconda's special Type CP Cable is used throughout.

The corrosion problem at Continental's 163-well lease at Ventura, Calif., was pretty typical: 15 casing failures in 3 years. Cost of repairs – from $22,000 to $61,000 a well – averaging about $125,000 a year for the 3 years that corrosion has been a serious problem.

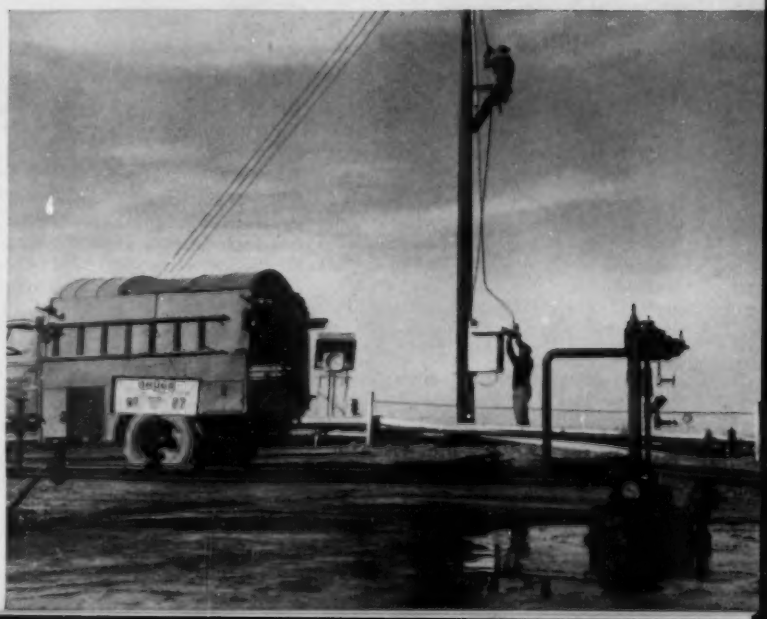
In May, 1954, Continental engineers began investigating cathodic protection to protect oil well casings. One well was set up with cathodic protection – and after six months, a visual examination and an electrical survey showed a definite lessening of corrosion potentials.

Last year, cathodic protection was expanded to all 163 wells—the first time an entire lease has been protected against corrosion of oil well casings by CP. The cost: $109,000—less than the cost of 3 casing failures.

Heart of the CP system is 49,000 feet of Anaconda's Type CP Cable. Designed *especially* for cathodic protection, Type CP Cable promises longer cable life because of resistance to oil, soil acids, and electroendosmosis.

The Man from Anaconda will be glad to give you more information on cathodic protection for oil well casings and other metal products—as well as complete data on Anaconda Type CP Cable. Call or write today: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

SEE THE MAN FROM **ANACONDA®**



(above, right)
Three anodes—3-by-60-inch shafts of graphite—were used for each casing, buried 10 to 15 feet apart and 11 to 30 feet deep. When wells were grouped, the number in the common field was cut. Here, one worker prepares to lower anode in hole while second man holds bag of carbon coke.

(middle, right)
After ditch-digging machine carved out 18-inch trench, Anaconda's special Type CP Cable was buried in the ditch, connecting the rectifier on base of power pole to anode bed and well head. In some nearly vertical areas, cable could not be buried—but Anaconda's tough Densheath® jacket protects it from sun, wind and rain.

(bottom, right)
Final Step — juice from overhead lines was connected to the CP system.

®Reg. U. S. Pat. Off.

for Type CP Cable

DRAFTING TRENDS

POST's handy checklist can speed up your Drafting Room Checkup and serve as a reminder of possible places where you can increase drafting efficiency.

The trend to thorough equipment checkups

Stepped-up production in the plant almost always means stepped-up activity on the board. Unfortunately, there is rarely time to stop and take stock of what is happening to drafting room efficiency as the work load increases. It is often necessary to improvise with what you have, or hastily expand as the need occurs.

With the shortage of manpower obviously continuing, it is apparent that a careful, critical review of drafting methods and equipment can lead the way to greater productivity. Department heads in some companies are setting aside a specific time every year to *completely analyze the drafting room.* The trend is to planning additions, improvements and reorganizations during such checkup periods.

One way to pinpoint possible increases in productivity is to go, item by item, through a checkup-list showing every type of product used in a modern, well-equipped drafting room. Such a list is available from the Frederick Post Company. It covers equipment and supplies from A to Z and suggests where you can make improvements.

Here are some typical examples of what you might look for during a Checkup: Cutting down waste motion by using modern drafting tables and drafting machines; eliminating time-consuming methods by using special grid-lined sketch pads, templates and other devices; reducing fatigue and increasing comfort by installing newer equipment; saving space with up-to-date files, etc.

Whatever the need, a logical, well-planned analysis of current and contemplated drafting operations is likely to unearth improvements.

Trained specialists in complete checkups

Practical assistance in making your checkup can be obtained from your POST supplier, who frequently helps make such efficiency surveys. He is experienced in all phases of drafting room operation and is a valuable source of ideas for everything from a major reorganization to producing hard-to-find supplies. Call your POST supplier and ask him about some of the techniques other companies use in surveying drafting room operations and boosting productivity. You will find his thinking a valuable addition to your own appraisals.

For more information and a POST checkup-list, write to the Reader Service Division of the Frederick Post Company, 3644 N. Avondale Ave., Chicago 18, Ill.

POST

SENSITIZED PAPERS & CLOTHS • TRACING & DRAWING MEDIUMS • DRAWING INSTRUMENTS & SLIDE RULES
ENGINEERING EQUIPMENT & DRAFTING SUPPLIES • FIELD EQUIPMENT & DRAFTING FURNITURE

They Say—

Natural gas lags behind

"In 1955 natural gas accounted for 39 per cent of the B.t.u.'s produced but brought in only 12 per cent of the total value of production at the wellhead including gasoline-plant products. Moreover, in 1955, gas B.t.u.'s sold at wellhead on the average for a little less than 25 per cent of the value of crude B.t.u.'s. Today natural gas is not carrying its share of the finding and developing cost load. Perhaps the exploratory effort has not been impaired to date. In time, however—and sooner than later—the revenue at the wellhead will be insufficient to carry the expanding finding and producing effort unless the price of natural gas is allowed to reach its competitive level along with other prices."

I. H. CRAM

Ira H. Cram, senior vice president, Continental Oil Co., in a speech before general management section of American Gas Association.

Praise for "Oil Hits Back!"

". . . This is one of the most excellent jobs of marshalling facts and statistics for easy consumption that I have seen. It would help if O.I.C. would supply similar material for use during Oil Progress Week . . ."

J. C. Kiersted,
Sunburst, Mont.

Highways must keep pace

"Since last July, when the Highway Act was signed by the President, the taxpayers of the nation have been coughing up their hard-earned dollars in amounts sufficient to meet the proposed rate of construction. Should there be a continuing lag between available funds and rate of progress, serious repercussions may be anticipated.

"While the people have evidenced a willingness to put up the money to finance the accelerated highway program, it cannot be expected that the same willingness will be evident if we should unfortunately find ourselves in a situation where tremendous balances are being accumulated in the highway trust fund.

". . . Many eyes are focused on the

The unnecessary tool . . . YOU HOPE!

So do we . . . But unfortunately, in-the-hole equipment failure has not been eliminated from the drilling picture.

Chances are it won't for awhile, so until it is, consider the next best thing . . . handling the fishing job in the quickest way with a minimum of lost drilling time.

Consider having an American Iron Overshot on hand when you need it. Even if it becomes the "unnecessary tool", it'll be the best Hole Insurance you can carry.*

***American Iron Releasing & Circulating Overshots are available in single and double bowl with a variety of Overshot Accessories.**

For quality products . . . buy through your Supply Store.

Another AMF Product
PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
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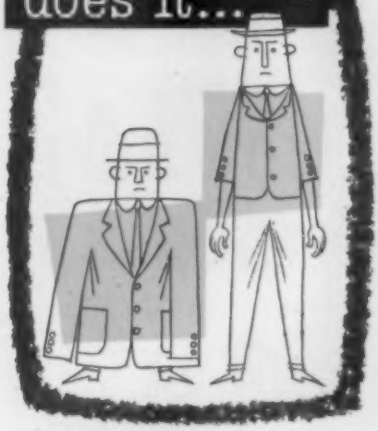
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

AMERICAN IRON & MACHINE WORKS CO. INC.
MANUFACTURERS OF A OIL FIELD EQUIPMENT
OKLAHOMA CITY

no one coat does it...



one source does

Valdura offers maintenance paints made from specific resins for every condition

EPON

VAL-CHEM. Versatile, chemical resistant metal primer for use under any finish coat. VALPON ENAMEL. Prevents damage by oils, solvents, alkalies and other chemicals on wood, metal or masonry.

PARLON

PARAVAL ENAMEL. Not affected by acids, alkalies and other chemicals. Used on wood, metal, concrete or masonry. RUBBER BASE ENAMEL. Combines excellent exterior durability with high chemical resistance.

BAKELITE

SUPER SERVICE ENAMEL. Resists chemical, moisture and abrasive conditions on metal wood or masonry. ASPHALT ALUMINUM PAINT. 98% waterproof metal coat prevents rust, rot, corrosion. Highest reflectivity.

COAL TAR

SEWAGE DISPOSAL BLACKS. Used for protecting concrete and metal surfaces from water, etc., found in sewage plants, reclamation projects, refrigeration systems, metal and concrete pipe, marine exposures.

URETHANE

URAVAL. The very latest type of coating that combines the ultimate in resistance to chemicals, solvents, marring and abrasion. Uraval will stand up where all other types of coating have failed.

ALKYD

M & F ENAMEL (General Maintenance), VALKOTE (Implement Enamel), DARYWHITE. Products that utilize the outstanding durability of alkyd resins. All these coatings are hard, tough, quick drying and color retentive.

Valdura maintenance paints are stocked by leading industrial distributors everywhere!

VALDURA PAINTS THAT ENDURE

VALDURA
HEAVY DUTY
PAINT DIVISION
AMERICAN-MARIETTA CO.
101 E. Ontario St., Chicago 11, Ill.
687 Wellington St., Ottawa, Canada

highway program, and any failure to make reasonable progress could result in a curtailment of this ambitious undertaking."

George H. Fallon, chairman of the House subcommittee on roads, in a speech before the Georgia Highway Contractors Association.

Opportunity to go broke

"Enactment of Senator Kefauver's 'Equality of Opportunity Bill' (S-11) promises only equality of opportunity to go broke.

". . . (It) would substitute management by lawsuit for the competitive conduct of business under the businessman's right to meet competition in good faith.

"A basic misconception has been voiced . . . that a large supplier can discriminate at will for predatory or monopolistic purposes without regard to the effects of its acts on smaller businessmen. That assumption ignores the business fact that such a supplier reaches the ultimate market—the consumer—through a large number of small businessmen."

Howard G. Vesper, vice president and a director, Standard Oil Co. of California, Western Operations, Inc., in testimony before a Senate subcommittee.

Technical men in industry

"Much has been written regarding the shortage of technical personnel in this country as compared to Russia. However, no attention has been paid to the importance of quality over quantity . . .

"Not everybody can be considered a professional person on the basis of his education. A professional man regards his college degree as an introduction to further studies which he continues throughout his life keeping abreast with science and opening new frontiers in the study of the unknown. Overcrowding our schools with students who choose their career for purely pecuniary considerations may lower the scholastic standards and reduce the opportunities for developing the outstanding individuals on whom the future of the country depends.

". . . Like executives, outstanding scientific and technical personnel cannot be hired indiscriminately or created by mass production methods. They must be brought-up by the companies themselves. Their abilities must be utilized to the company's best advantage. They cannot be exposed to the political atmosphere which may exist in some of the large concerns as this distracts their mind and lowers

THREADS LAST LONGER

with

IMPROVED
to meet the demands of faster, deeper, drilling

MONEY BACK GUARANTEE!

Sold through your favorite supply store

USE JIMMY GRAY DOPE BRUSHES

PETROLEUM DISTRIBUTING COMPANY
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Deep in the Earth There's Another Reason Layne's on Top!

THE LAYNE IMPELLER is that reason, because a pump can be no better than its impeller.

There are two main considerations in impeller evaluation—QUALITY AND PERFORMANCE.

QUALITY—The materials used in the manufacture of a Layne impeller must be tough, durable and possess excellent *surface quality* and they must be able to insure *dimensional accuracy*. Metal patterns are used in casting high quality phosphor gear bronze into Layne impellers. Other special metals are specificed when necessary.

PERFORMANCE—A Layne impeller is correct in hydraulic design based on 75 years of Layne experience through thousands of successful installations and tests. Correct impeller design determines a pump's performance in any particular hydraulic condition.

Each Layne impeller is precision manufactured. Because no one technique is adequate, both hand finishing and special machining are used in balancing and tooling the impeller. Working to a rigid and minimum tolerance, specially designed gauges and instruments check each step to the finish of a Layne impeller . . . from water passages and angles to vane thickness.

Layne Impeller sizes range from 4" diameter and up, as specified.

The result — an impeller which operates deep in the recesses of the earth dynamically in balance. Each remaining component part of a Layne pump receives the same careful engineered attention, and when assembled assures complete pump perfection giving you years of trouble-free service.

Layne's 75 years of experience puts Layne on top!

1882 — 1957
Layne
75 YEARS OF PROGRESS

WATER WELLS • VERTICAL TURBINE PUMPS • WATER TREATMENT

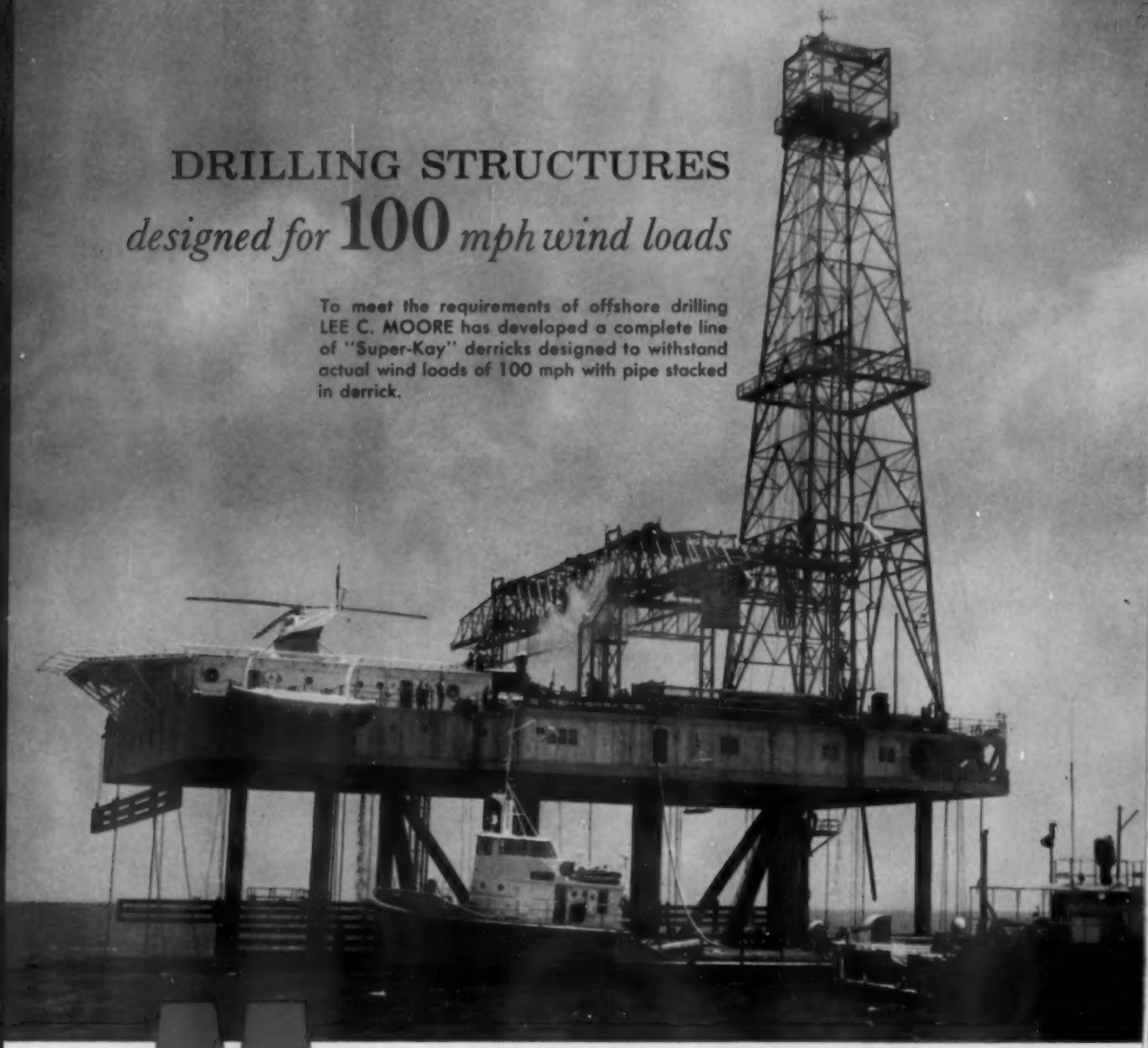
LAYNE & BOWLER, INC. MEMPHIS

General Offices and Factory • Memphis 8, Tennessee

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

DRILLING STRUCTURES
designed for 100 *mph wind loads*

To meet the requirements of offshore drilling LEE C. MOORE has developed a complete line of "Super-Kay" derricks designed to withstand actual wind loads of 100 mph with pipe stacked in derrick.



Four wells are drilled from this 140′ **LEE C. MOORE SUPER-KAY** derrick by shifting the crown, rotary and racking platform.

LEE C.

Moore

CORPORATION

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EXPORT OFFICE: Room 624, International Bldg., 630 5th Ave., New York 20, New York

FOREIGN LICENSED MFR.: Oil Well Engineering Co., Ltd., Cheadle Heath, Stockport, England

their productivity. Their work must be estimated on an impartial basis . . . "

V A. Kalichevsky, consulting chemical engineer, in a speech before the American Institute of Chemists in New Orleans.

Graduates scarce commodity

"It is well known that any commodity in short supply tends to rise in price, and if industry continues to bid for the university graduate it can possibly lead to a false sense of values. Industry, rather, should get behind our institutions of higher education and enable them to provide more of this 'scarce commodity.'

"Having recently been in Russia and seen at first-hand the value that country is placing on education, one cannot help but make comparisons and be disturbed with some aspects of our own system. . . I believe there is evidence to show that our graduates are better mentally - equipped to be 'all-around' citizens.

"Nevertheless . . . one is impressed with the Russian system whereby every child will be educated to the limit of his or her mental capacity. This stands out in contrast to our system where a good education is limited, in many cases, by the economic status of the parents."

W. Harold Rea, president, Canadian Oil Companies, Ltd., in a speech before Canadian Oil shareholders.

CALENDAR OF EVENTS

APRIL

16-18 Petroleum Industry Electrical Association annual meeting, Shamrock Hilton Hotel, Houston.

16-18 Petroleum Electric Suppliers Association, Shamrock Hilton Hotel, Houston.

16-18 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 National Petroleum Association, fifty-fourth semiannual meeting, Cleveland

17-18 Western Oil and Gas Association, annual Southern California safety conference, Pacific Coast club, Long Beach.

18-19 Texas Petroleum Research Committee and Permian Basin Section of American Institute of Mining, Metallurgical, and Petroleum Engineers, tenth annual oil-recovery conference, Midland, Tex.

22-25 Canadian Institute of Mining and Metallurgy, annual general meeting, Chateau Laurier, Ottawa.

23-25 Petroleum Conference on Oil and Gas Taxation, sponsored by The Oil Institute of McMurry College, Texas Mid-Continent Oil and Gas Association, Texas Independent Producers and Royalty Owners Association, and West

These BS&B Rupture Discs Can Give Your Pressured System...
Standard Rupture Discs, pre-bulged . . . available in a broad range of sizes, pressures and metals.
Vacuum Supports . . . installed under prebulged rupture discs to prevent their collapse under vacuum; fit exact disc contours.
Plastic Linings . . . and coatings for protection of prebulged discs under any specific corrosive condition.
Model D & DV Rupture Discs . . . for high temperature, pulsating pressure and corrosive services. Model DV includes vacuum support.
Model 1A & 1B Rupture Discs . . . for lower rupture pressures than prebulged discs; excellent for corrosive services. Model 1B includes flat vacuum support.

Positive Pressure Protection From 3 To 50,000 PSI

Installing a BS&B Rupture Disc on a pressured system provides protective insurance against a major disaster. Thousands of BS&B Safety Heads, each containing a BS&B Rupture Disc custom made to meet the individual requirements of the system it protects, are now guarding pressured systems in all types of industries.

Fully accepted by most local and national codes for use as either primary or secondary pressure relieving devices, BS&B Rupture Discs can be *your* positive and final measure of protection for the unexpected emergency.

THE "CIRCUIT BREAKER" of Pressured Systems

Why not talk it over with your BS&B Representative . . . or write for further information to . . .

BLACK, SIVALLS & BRYSON, INC.

Safety Head Division, Dept. 2-A4
7500 East 12th Street
Kansas City 26, Missouri

What the WELL-DRESSED, MEDIUM-PRESSURE Wells are wearing

This well is equipped with the compact "Tee Base Type" HERCULES Duplex Stuffing Box and HERCULES "Type SO" Tubing Head. The Tubing Head is equipped with HERCULES original overhead packing arrangement and self-aligning hinged slips, making this a simple yet complete hook-up, featuring safety with simplicity and minimum of parts.

AVAILABLE THROUGH ALL SUPPLY STORES

If you have any problems involving well head equipment, a phone call, telegram or letter will bring you the desired information — quick.

HERCULES TOOL Company

MANUFACTURERS OF OIL FIELD EQUIPMENT SINCE 1924

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Experience

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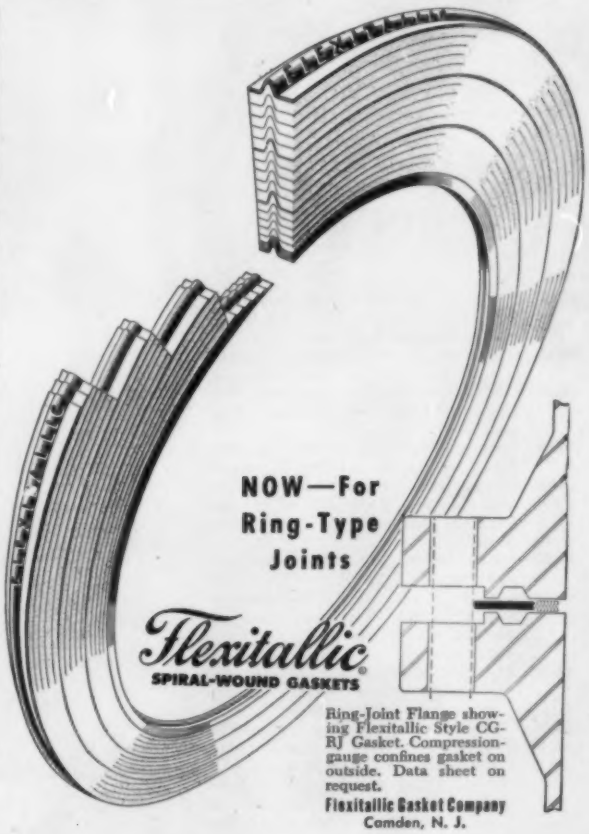
Here are some of the reasons why oil men call us "Bankers" and bankers call us "Oil Men": years of practical experience in *all* types of oil loans; service that includes Trust Dept. counsel. Remember, it pays to

Think 1st

FIRST NATIONAL BANK & TRUST CO. of Tulsa

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION SINCE 1895



NOW—For Ring-Type Joints

Flexitallic® SPIRAL-WOUND GASKETS

Ring-Joint Flange showing Flexitallic Style CG-RJ Gasket. Compression-gauge confines gasket on outside. Data sheet on request.

Flexitallic Gasket Company Camden, N. J.

Central Texas Oil and Gas Association.

24-26 Natural Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

25-27 Appalachian Geological Society, Kentucky Geological Society, joint field conference, southeastern Kentucky.

25-27 American Association of Petroleum Landmen, third annual convention. Hilton Hotel, San Antonio, Tex.

27 American Institute of Chemical Engineers, Oklahoma state meeting, Bartlesville, Okla.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla

29-May 1 Southern Gas Association, annual convention, New Orleans.

MAY

1-3 American Petroleum Institute, Division of Production, eastern district meeting, William Penn Hotel, Pittsburgh.

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

6-8 American Geophysical Union, thirty-eighth annual meeting, National Academy of Sciences, Washington, D. C.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 Canadian Institute of Mining and Metallurgy, eighth annual convention, petroleum and natural-gas division, Macdonald Hotel, Edmonton.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

9 Panhandle Producers and Royalty Owners Association, annual meeting, Herring Hotel, Amarillo, Tex.

9-10 Fourth annual heat-transfer conference, Oklahoma A. & M. College, Student Union Building, Stillwater, Okla.

9-10 Symposium on use of surface active agents in water flooding, Pennsylvania State University, department of petroleum and natural gas, State College, Pa.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

16-17 American Right of Way Association, third annual national seminar, Conrad Hilton Hotel, Chicago.

16-17 American Petroleum Institute, division of production, Pacific Coast district meeting, Hotel Biltmore, Los Angeles.

16-18 Geological Society of America, south-

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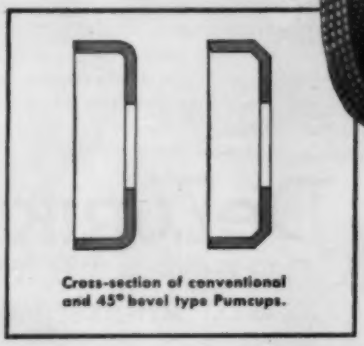

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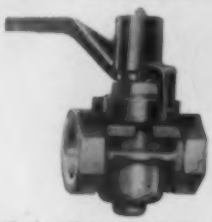

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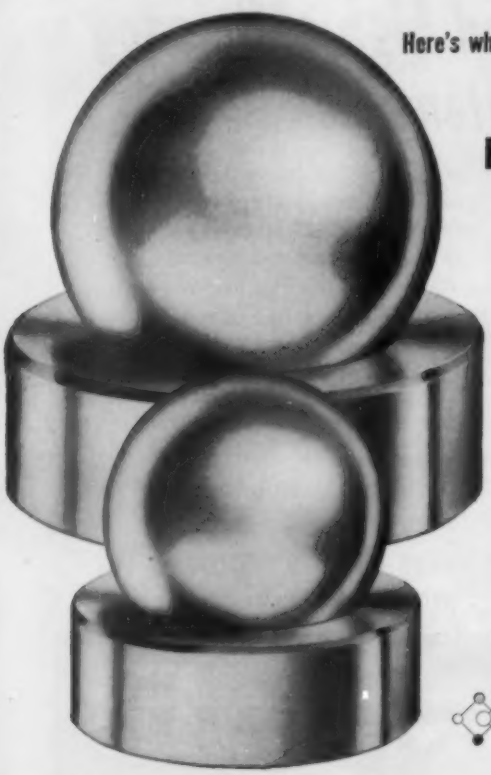

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eastern section, annual meeting, Morgantown, W. Va.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

20-22 American Petroleum Institute, division of transportation, central committee on transportation by water and tanker corrosion symposium, San Francisco.

20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.

23-24 American Institute of Mining, Metallurgical, and Petroleum Engineers, third annual joint meeting, Rocky Mountain petroleum sections, Northern Hotel, Billings, Mont.

23-24 Western Petroleum Refiners Association, southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

27-29 Rocky Mountain Oil and Gas Association, twelfth annual convention, Denver.

29-31 Annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

JUNE

3-5 Petroleum Electric Power Association, annual convention, Amarillo, Tex.

3-7 Oil-Heat Institute of America, thirty-fifth annual convention, Sheraton-Plaza Hotel, Boston.

4-6 Second annual Appalachian Underground Corrosion Short Course, West Virginia University, Morgantown, W. Va.

6 Pennsylvania Grade Crude Oil Association, thirty-fourth annual meeting, Penn-Sheraton Hotel, Pittsburgh.

9-13 American Society of Mechanical Engineers, semiannual meeting, Sheraton-Palace Hotel, San Francisco.

10-12 Interstate Oil Compact Commission, midyear meeting, Yellowstone Natonal Park.

10-14 Gordon Research Conferences, petroleum, Colby Junior College, New London, N. H.

16-21 American Society for Testing Materials, annual meeting, Calfonte-Haddon Hall, Atlantic City, N. J.

17-21 Gordon Research Conferences, catalysis, Colby Junior College, New London, N. H.

19-21 Association for Computing Machinery, twelfth annual meeting, University of Houston, Houston.

20-21 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Broadview Hotel, Wichita.

20-22 National Oil Scouts and Landmen's Association, annual meeting, Hotel Cosmopolitan, Denver.

23-27 Canadian Gas Association, Jasper Park Lodge, Jasper, Alta.

JULY

8-19 Industrial Statistics for the Process Industries, second annual conference, sponsored by American Society for Quality Control and the University of Oklahoma, Lockett Hotel, Norman, Okla.

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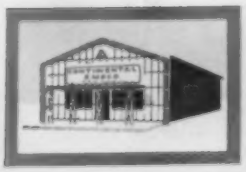

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JOURNALLY SPEAKING . . .

The Answer Man

ONLY half a shelf short of the most complete oil library in the world. That's the frustrating fix of a fellow who's been collecting nuggets of knowledge about our favorite industry for nigh on to half century.

Until he retired 3 years ago, Edward B. Swanson was petroleum economist of the Department of the Interior, and well known for his statistical analyses of trends in the trade. Not so well known was his hobby of collecting every scrap of material ever written about oil.

Over the years Ed built up a personal oil library that was one of the best to be found anywhere. He even collected all the novels and fiction books with an oil background—even though some of them took liberties with the facts which must have turned the stomach of a careful economist.

Ed's chief rival as a petroleum bibliophile—but a very friendly rival—was the late great E. DeGolyer, millionaire Dallas geologist and philosopher. To compete against "De's" wealth and world-wide prestige, Ed had only his salary as a civil servant—plus his persistence, his correspondence with oil men all over the world, and his habit of haunting old book stores.

Ed made his hobby pay off by reading his books and remembering what he read and where he read it. He became a petroleum quiz kid, and was known as the one man in the Government who could answer questions about oil that stumped everyone else. Letters and phone calls from senators or school children to any federal agency got shunted to Ed for answering as a matter of routine. This gave him a job security better than the civil-service law.

But finally the calendar and the retirement law overtook him. Ed sold his library, lock, stock, and barrel, to the Venezuelan Government and settled down to enjoy his pension. But he had made himself indispensable. The Interior Department had to call him back as a part-time consultant—chiefly to answer questions.

For this Ed needed his library. So he started out all over again to build another, but this time as a gift to the Government. The Interior Department's library has all recent and current publications about petroleum, but the red tape of procurement procedure prevents the Government from getting competitive bids on rare and out-of-print books.

Ed twisted the arms of a few well-to-do oil men and got them to kick in a couple of thousand bucks to assist him in his labor of love. He knew what books he wanted and where to get most of them. In 3 years he has built up the department's collection to where it lacks just eight titles of being the world's only absolutely complete oil library.

Now he's reached the end of his rope and needs help. He still has some purchase money left, but can't locate the missing volumes. Anyone who wants to aid the cause is asked to search his attic, his local book stores, and the memorabilia of old-timers in the oil business.

Probably the rarest of the missing items is Vol. II of "The Romance of American Petroleum and Gas," published in 1911 by Crum and Dungan. This was mostly biographies of petroleum pioneers, and Vol. I was snatched up like hot cakes by the relatives of those mentioned. But before Vol. II could get wide distribution the Crum residence in Bradford, Pa., burned and with it the stock of this work.

Another rarity is "Petroleum—Where and How to Find It," by Anthony Blum (1922). If this book lived up to its title it's no wonder it was a sellout.

Three other missing links are "Petroleum in California," by Redpath (1900); "Sixty-Three Years in the Oil Field," by Youle (1928); and "Thirty-Five Years of Oil Transport," by James Dodds Henry (London).

The remaining missing titles are standard reference works which ought to be located in any reasonably complete old oil library: the National Oil Scouts' Association Reports, Vols. I through IX; Skinner's Oil and Petroleum Yearbook for 1910, 1911, 1912, 1914, and 1915; and the Fourth Edition of Dorsey Hager's "Petroleum Geology."

If Ed could just locate these missing items he could retire again, this time with the knowledge that somebody else will have the facilities for answering any oil question for which an answer can be found.

—Henry D. Ralph.

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Unconnected wells need markets, not more law

THE eyes of all oil producers are on Texas, where the Railroad Commission is considering a plea by producers to force crude-oil pipelines to extend gathering systems to unconnected wells.

This situation is not peculiar to Texas. It exists, in more or less degree, in many areas in the Mid-Continent and in the Rockies. Other states have laws similar to Texas.

THE LEGAL QUESTION is can a state regulatory body order a pipeline to extend its facilities where the line says it is uneconomic? This issue has never been tested in any state.

Texas producers say yes. They argue that a regulatory commission can (within limits of reasonableness and caprice) order a public utility to extend its facilities to give equitable service to all customers.

This sounds reasonable on its face. But there are two important distinctions. A franchised utility, in return for a monopoly and a guaranteed return, contracts to serve an entire city. Pipelines have no such franchise-contract obligation. This may be legal hairsplitting, but the Texas commission will be pioneering new ground if it attempts to force the laying of gathering lines at the request of every producer.

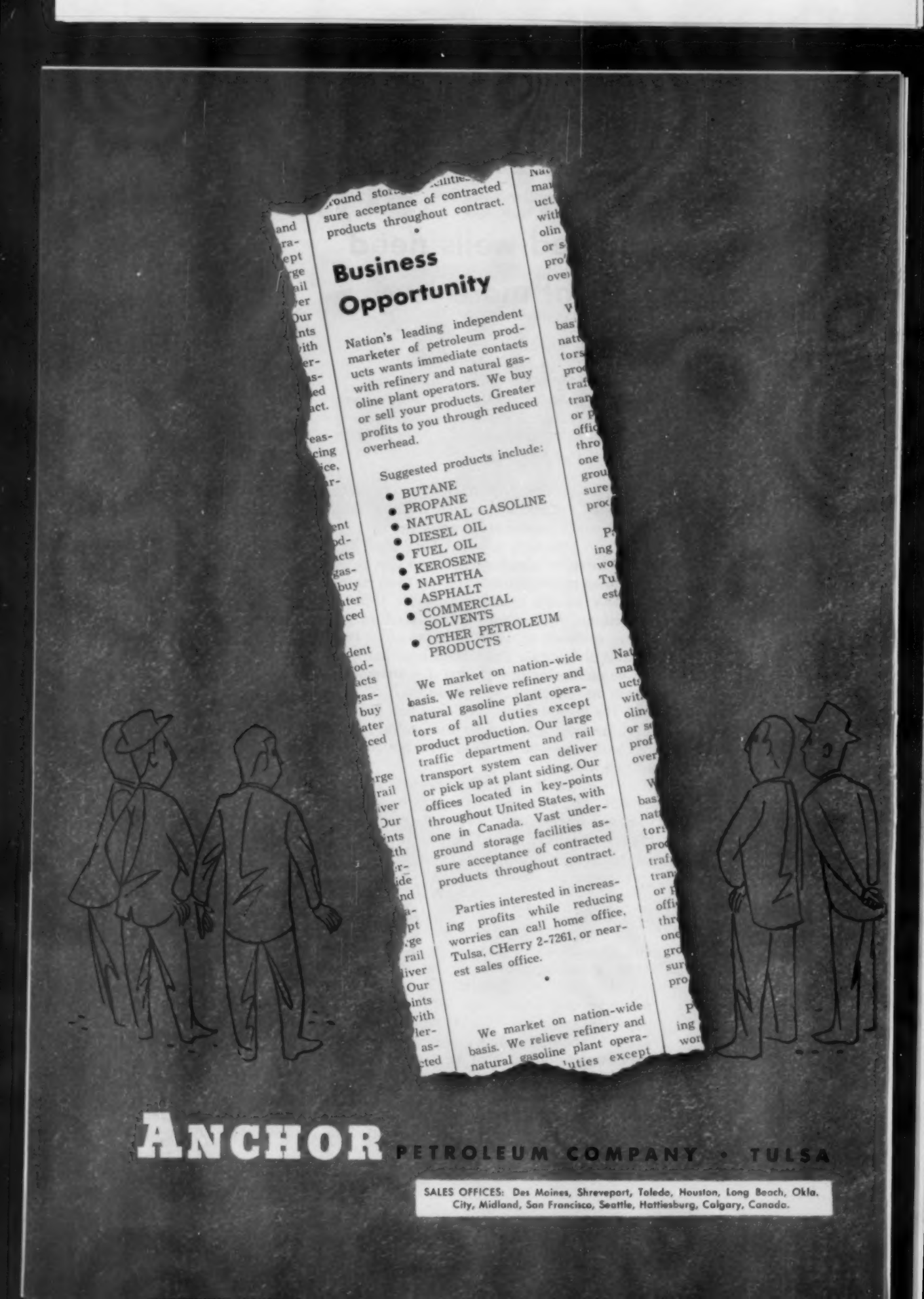
The biggest distinction—and one that is commonly overlooked—is that pipelines (with a few minor exceptions) don't buy oil. As common carriers they only move oil that has been bought by somebody else and consigned to some refinery.

Assuming that state commissions can and do force pipelines to connect all wells, this would not necessarily benefit producers much. What producers want is a market at the wellhead. State bodies can force purchasers to take ratably when they do buy, but they can't make anybody purchase more total oil than he wants.

THERE IS NOTHING in this situation that wouldn't be cured by a strong sellers' market for crude. If this came to pass, say by some reduction in imports, purchasers would seek new connections and pay trucking costs if necessary. Pipelines, always eager to expand their throughput, would extend gathering systems voluntarily or at the urgings of purchasers.

Pipelines will fight this Texas test case. But even if they win, all producers may benefit from the proceedings. Pipelines and purchasers everywhere are examining their operations to see if they can voluntarily serve some unconnected wells without undue loss. They are particularly looking to see if they are violating ratable-take statutes.

The existence of so many unconnected wells is certainly inequitable if not legally discriminatory. It discourages development and weakens the economy. If voluntary action or common-carrier and ratable-take statutes can't cure it, producers may be expected to intensify their attack against imports.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FPC Control Inherent in New Gas Bill

WASHINGTON.—The 1957 version of the Harris gas bill has gone to Congress.

The bill, sponsored by Reps. Oren Harris of Arkansas and Joseph P. O'Hara of Minnesota, does not "free" independent producers of Federal Power Commission price control as did the bill passed by the House in 1955. But it sets up methods and a formula by which the FPC would pass on producers' sales contracts.

The bill wipes out use of the public-utility type of price-fixing by the FPC. It states specifically that natural gas is a commodity and provides that producers shall be given the fair field price.

Support certain . . . The bill has not yet received the blessing of the administration. But O'Hara told newsmen he had been "authorized to say," presumably from the White House, that he "was sure the President will support the principles" of the measure.

Harris also said the President has not seen the bill. But previously he has said he would not introduce it until satisfied that the administration and the President himself are "in accord with what is proposed," he pointed out.

Apparently the only administration or congressional leader to be consulted was House Speaker Sam Rayburn of Texas. Rayburn previously has said there would be no "drive" for the measure unless the White House came out formally in its behalf.

The bill is due to get a mixed reaction from the gas industry, Harris admitted.

Regulation of natural gas prices now "seems to be the national policy," Harris told the House in outlining his bill.

So it is essential that a workable plan for regulation be adopted to lessen the workload on the Federal Power Commission. The bill "is not altogether satisfactory to everyone, even in the industry, but it seems to be the best approach to a difficult problem," he said.

What it provides . . . Here is the gist of the bill, which rewrites the natural gas act:

. . . Sec. 1 (B) is extended to provide federal regulation of producers' contract prices. But no further.

The FPC is given full authority in this field by a provision that state and local authorities may not regulate the price of gas going into interstate commerce "either at or before the commencement of the transportation."

. . . New contracts (those made after February 1, 1957) may not carry two-party or three-party favored-nation clauses, "better market" or "price redetermination" clauses, or spiral escalation provisions.

. . . All new contracts must be filed with the FPC within 30 days. They will be subject to protest by any interested party or the FPC itself.

. . . If no objection is offered or held valid by the FPC the contract will be automatically approved.

. . . If it is a "definite price" contract stating a specific price, including specific increases to be made at definite future dates and provision for reimbursing the seller for changes in production, severance or gathering taxes, the FPC will have no further jurisdiction.

. . . If it is an "indefinite price" contract, under which the price may be determined or changed, the FPC will have no jurisdiction "until and unless such indefinite pricing clause operates to increase the price."

. . . The FPC will have control of all future price increases arising out of indefinite pricing clauses, whether

Harris' Thoughts on Bill:

- **The "major segment" of producers will support the bill, but "some will be unhappy."**
- **Distributing companies will be divided, but many will back it.**
- **The pipeline companies will be in favor of the bill, with one unidentified exception.**
- **The legislation is "imperative" in the interests of the public. It will bring about an increase in supply, urgently sought in many areas. And it will tend to provide lower prices than are probable under present FPC control.**

the contracts were in effect February 1 or made thereafter. The bill provides that such increases are not to go above the reasonable market price of the gas.

"The commission shall recognize the fact that natural gas is a commodity, and shall not consider costs or use the public utility rate base cost-of-service concept or formula," the bill says in this connection.

... In passing on prices the FPC is to consider whether the price will assure a continuing adequate supply of gas to consumers, whether the price was reached competitively and in arm's-length bargaining, the "reasonableness" of all contract provisions, quality of the gas and conditions of delivery.

... The FPC must consider the current level of field prices under other contracts in the same field and in other fields and areas which contain comparable terms.

"The reasonable market price is not necessarily the price of the last sale, the highest price, the lowest price, the weighted highest price, the average field price, or other price arrived at by the mechanical application of a single criterion," the bill states.

"It is a price which the commission, exercising its judgment and discretion in weighing, among other things directly relevant to the issue, all factors enumerated above, determines is the reasonable market price."

... The bill outlaws contract provisions permitting cancellation or the ending or reduction of deliveries if the Government asserts jurisdiction over the contract.

... It will be unlawful for a natural gas company to pay, or a seller to receive any price in excess of that which the buying company is obligated to pay under a contract.

... Pipelines, like independent producers, are to be allowed the reasonable market price for gas they produce or buy from affiliates.

... A "grandfather clause" in the bill would validate all prices which were being paid on June 7, 1954, or the date on which the bill takes effect. But any price-increase cases pending before the FPC on January 1 last may be continued.

Early hearing planned . . . The bill is based upon policies worked out by FPC Chairman Jerome K. Kuykendall in meetings with industry groups which he was asked to hold after the gas bill was vetoed by Eisenhower last year.

Copies have been sent to the Budget Bureau, FPC, Justice Department and other interested agencies with requests for their views.

Following the receipt of agency reports the House commerce committee, of which Harris is chairman and O'Hara second ranking Republican member, will hold hearings. The hearings probably will start before the middle of May.

A formal statement of the President's views on gas legislation is expected to be issued shortly, Harris said.

But if the bill gets quick action from the committee and goes to the House floor, the big question is whether it can be made law this year.

Given administration support and backing by the House leadership, it is seen as having smooth sailing in the lower chamber.

But there is no indication whether the bill will be put in the Senate and pushed with sufficient vigor to get through before adjournment this summer.

Porter on public relations:

Move Quickly with Plain Talk

TULSA.—The oil industry needs to move faster and talk louder and plainer if it's going to sell itself to the Government and the public.

The way to do this, says Frank M. Porter, president of the American Petroleum Institute, is to be on the offensive—not only during emergencies but between attacks on the industry.

It doesn't make sense for the oil industry "to go mute with stage fright when addressing the public and then put on the noisiest brawls in the nation whenever a family squabble arises," Porter said.

His formula for good relations with the Government and the public: Be ready with oil's story, move fast when the need arises, and talk plainly.

"Our difficulty seems to be a tendency to keep saying that something must be done, when the occasion cries for us to get going and do it."

FRANK M. PORTER
. . . "let's be ready with our story."

Government relations . . . Porter told 700 production men at the spring meeting of the Mid-Continent district of the A.P.I.'s Division of Production here last week they should start worrying about public relations.

He called attention to recent criticism of "foot-dragging in the field of government relations, and undue reticence in public relations."

The past has demonstrated that the industry cannot afford to regard public relations as an "unnecessary frill" and cannot consider government relations as "an annoying distraction," he said.

After Suez . . . Porter thinks the industry came out on top of the most recent barrage of oil-industry criticism — although belatedly. When the facts were finally presented before Congress and the public there was a distinct change in the tide of opinion, he said.

"Political opportunists tried to capitalize on some unfortunate misunderstandings, where the European oil lift was concerned, and they really let go on the long, long overdue price adjustments.

"The attack backfired, however, for oil men met the criticism squarely. Frank and open replies, plus indisputable facts and figures clarified the misunderstandings."

He sees more troubles for the oil industry as an aftermath of the Suez crisis, because of "difficult adjustments" that must be made.

"Whatever form trouble may take," he said, "let's be ready with our story. Let's hearten our friends, and amaze our enemies by being prepared."

Oil Lift Lauded

House committee's findings from hearings in February should take sting from report scheduled by O'Mahoney

WASHINGTON. — The European oil lift was hailed in Congress last week as "a stupendous achievement on the part of the oil industry."

The House commerce committee in its formal report on hearings held in February said the oil lift was "eminently successful." The lift provided Europe with 92 per cent of its normal needs during the winter and is now meeting full requirements.

The committee lauded the industry for its work in that direction. But it criticized it for the way it increased prices on crude and products last January.

The price hikes were poorly timed, the committee said. There may have been long-run justification for them in higher costs, but they appear to have been set "to take advantage of the Middle East crisis."

Beyond the comment that the way the raises were made was "regrettable," however, the committee made no complaint.

The House group's report is expected to take much of the heat out of the more critical report expected from the joint subcommittee headed by Sen. Joseph C. O'Mahoney of Wyoming which was probing the oil lift and prices at the same time.

The House committee, headed by Rep. Oren Harris of Arkansas, was more critical of government officials than of the industry. It charged, in effect, that they had made a "crisis" where no crisis existed.

"The reasons prompting such statements are now even less credible since the Department of State, to which the administrators of the oil-lift program have said they looked for information on the critical nature of production abroad, is on record that production had not been appreciably impaired," the report said.

Harris pointed out that as long as 9 years ago his committee warned of the possibility of an interruption of Middle East supply lines. It repeated that warning 7 years ago.

Imports questioned . . . Now, Harris said, it is time to decide what reliance can be placed upon foreign supply sources.

"Recently all too clearly we have witnessed how a misplaced reliance by others on their sources of supply quickly can affect us," he said.

"It is but false economy from our national security point of view to permit foreign imports to bulk so large in our total supply if they cannot be relied upon with any degree of assurance, and if their presence or potential is such as to cause deterioration of our ability to count upon our own domestic supplies being ample when we must have them.

"Somewhere there is a proper balance of supplementing rather than supplanting imports."

The report offered a four-point program for protecting the United States against another cut in foreign supply:

. . . Adequate transportation facilities must be provided. Without it, standby capacity, now about 2,000,000 bbl. daily, is "not too meaningful."

. . . A minimum safe level of crude and product stocks as well as added stocks "reasonably safely stored." Recent events have raised questions of what minimum stock level should be.

. . . Greater emphasis on development of Western Hemisphere supplies. Here there can be more reliance on transportation accessibility.

. . . More attention to the development of liquid fuels from oil shale and coal. They might provide alternate sources "to the seemingly increasing costly national petroleum liquid reserves."

These matters have been tabbed by the committee for further study, the House was told.

Future probes . . . But the committee also may go further into the oil lift and prices, it was indicated.

A number of angles could stand further exploration, the report said. These include the operations of the Middle East Emergency Committee and the extent and desirability of the antitrust immunity granted it; the stand of the MEEC, Interior Department, and Office of Defense Mobilization on prices; and the operations of "certain" international companies and reconciliation of their interests with our national and foreign policies.

O.C.A.W. Makes Esso Debut

NEW YORK.—The Oil, Chemical, and Atomic Workers International Union has its toe in the door of Esso Standard Oil Co. For the first time, employes at one of the six Esso refineries has voted to affiliate with the giant A.F.L.-C.I.O. union.

Members of the Independent Petroleum Workers at Esso's Bayway refinery at Linden, N. J., voted 1,105 to 969 to affiliate with O.C.A.W. The election came a day after Esso announced plans to lay off 513 craft and processing employes at the 168,000-bbl. plant.

The layoff is a result of Esso's decision to shut down the plant's No. 1 fluid catalytic cracking unit, built during World War II. The unit has about one-third the capacity of Bayway's newer No. 2 unit. The company also decided to reduce the dismantling staff and some special maintenance workers.

What it means . . . Esso has six refineries—four in the East and two in the South. Total capacity is 653,000 bbl. daily.

Up to now, Esso refinery workers were represented by independent groups only. Some of these groups were affiliated with the Federation of Independent Oil Unions, which was organized in the winter of 1956 to keep independents from being swallowed up by the big 105,000-member O.C.A.W.

Both the O.C.A.W. and the federation are in the middle of their 1957 campaigns to increase wages throughout the nation *(The Oil and Gas Journal, April 8, page 72)*. O.C.A.W. wants a 27-cent hourly increase; the federation is seeking at 25-cent raise; and the best offer so far has been 5 per cent (about 13½ cents).

The National Labor Relations Board has to certify the Esso election before O.C.A.W. can bargain with the big company. NLRB approval is very likely since 85 per cent of the eligible workers voted.

Wage-contract bargaining at Esso's Bayway refinery has been going on between management and the independent group since June 1955.

The layoff . . . Full seniority was observed. The average service of those laid off was 5 years. They received layoff allowances of a week's pay for each of the third, fourth, and fifth years of service.

Thus, the average was about 3 weeks layoff allowance, plus vacation pay. Esso is working with other companies in this area to help relocate the men.

Boundary Claims Heard

● **Supreme Court has three choices: Favor the federal Government with quick decision; take depositions from Louisiana; or refer issue to full District Court trial**

WASHINGTON.—Claims of Louisiana, Texas, and Florida to a 3-league boundary in the Gulf of Mexico may be settled soon by the U. S. Supreme Court.

The court heard argument last week on the federal Government's suit to limit Louisiana to a 3-mile boundary *(The Oil and Gas Journal, April 8, page 68)*. Now it is faced with these courses:

. . . It may settle the issue quickly by granting the Government's motion for an immediate decision.

. . . It may grant the state the right to present depositions supporting its claim.

. . . Or it may send the case to a federal District Court for full trial, as urged by Louisiana.

Since the boundary claims of Texas and Florida stand on the same ground as that of Louisiana, the court's decision will apply equally to them although if it favors the U. S. Government it may be necessary to file separate suits against them later.

At the outset of the argument the court was told it is without power to affirm Louisiana's claim.

No state boundary can extend further seaward than the national boundary, U. S. Solicitor General J. Lee Rankin declared. And since 1793 the national boundary has remained constant at 3 maritime miles, he said.

The fixing of the national boundary is a matter of "political determination" by Congress and the executive branch, Rankin asserted. The courts are without power to interfere.

The case was heard by only seven of the nine justices. Chief Justice Earl Warren of California and Associate Justice Tom C. Clark of Texas left the chamber when the case was called.

At stake in the suit is a wide, undefined oil-rich belt of submerged lands off the coast of Louisiana. The court's immediate decision will settle title to a 7½-mile belt. But if the decision favored the U. S. Government an even wider area would be involved in the fixing of the line from which the boundary shall be measured.

The suit is a direct descendant of the Supreme Court's 1950 decision that the United States had "paramount" rights in the resources under the Continental Shelf beyond the mean low-water mark and the Tidelands Act of 1953 overturning that decision.

Federal arguments . . . The Government's suit is based on a provision in the Tidelands Act that the Gulf Coast states' boundaries are such "as existed at the time such state became a member of the Union, or as heretofore approved by Congress."

The gist of Rankin's argument was this: No matter how far seaward Louisiana's boundary ran prior to its admission to the Union, it became 3 miles "at the moment" of admittance.

Congress was "very careful" not to recognize the right of any state to a boundary beyond 3 miles, Rankin told the court. It didn't say all boundaries should be 3 miles, he admitted, but it left the issue to the courts.

In effect, Rankin said, Louisiana was told "if you can prove you have a different historic boundary you can test it in the courts."

Rankin asked only that the court give an immediate ruling fixing the boundary at 3 miles and declaring the United States entitled to all moneys collected by Louisiana from resources beyond that line.

He did not ask that the court fix the line from which the boundary should be measured. This could be determined later by a special master. A precedent for this was set by the court after its 1947 decision in the California tidelands case, Rankin said.

The special master's report on California has been in the Supreme Court's files for several years. The court itself has never acted on it and the Government has never asked for action.

Rankin indicated there will be litigation over the base line even if Louisiana wins a 3-league boundary. The state has figured its claimed boundary from a line drawn by the Coast Guard as the line where inland waters meet the open sea, he explained. But that line was merely for purposes of navigation and navigation aids, and is not a coast line or shore line, the Government claims.

Louisiana's claims . . . The Government's claim that Louisiana lost its offshore rights when it entered the Union was sharply challenged by W. Scott Wilkinson, special assistant attorney general, who submitted the state's case with Jack P. F. Gremillion, Louisiana attorney general, and Victor Sachse, assistant attorney general.

Louisiana brought with it into the Union the same seaward boundary it held before admission, Gremillion asserted. This was recognized in the act of admission and went unchallenged for more than a century.

The three Louisiana lawyers argued that the federal boundary historically has been at least 3 leagues from the coast in the gulf. They contended also that the Outer Continental Shelf Act of 1953 extended the boundary to the edge of the shelf.

Louisiana can submit proof that its boundary extends 3 leagues from where its mainland waters meet the Gulf of Mexico, if given a chance, the court was told.

The state agrees that there is a question about the location of the coast line from which the boundary should be measured. But that is a matter that should be referred to a federal District Court.

Wilkinson admitted that states on the east and west coasts can claim no more than a 3-mile boundary. But the gulf, he said, is an "enclosed sea." It should be compared with the Great Lakes where state jurisdiction runs as far as 77 miles into the water.

A decision in favor of the federal Government could make the tidelands again an issue in Congress. A tremendous amount of money from past, present and future oil operations in the 35-mile belt involved in the case is at stake. Louisiana authorities will fight to the last ditch. If the Supreme Court decides against the state, Congress will be asked to overturn the decision.

Four Corners Paying U. S.

WASHINGTON.—The big play in the Four Corners area is paying off for the Government, too.

Leasing of Indian lands in the area where New Mexico, Arizona, Utah, and Colorado meet has brought in more bonus money in the past 6 months than for the entire previous year.

More than $45,000,000 has been collected since last October, Interior Secretary Fred A. Seaton reports. In the whole previous fiscal year only $41,000,000 was secured.

Lease sales on the Ute and Navajo reservations brought $7,601,000 last October, $33,686,000 in November, and $4,358,000 last month, Seaton said.

High Imports Cited

Cabinet committee studies first post-Suez schedules

WASHINGTON.—A threatened excess of oil imports over the next 6 months was laid before the Cabinet Fuels Committee last week by new Mobilization Director Gordon Gray.

The actual volume programed by the importing companies for the first half-year following the reopening of the Suez Canal has not been disclosed. But it is reported to be well above the proper level based on the cabinet committee's formula.

No immediate decision is expected to be reached by the committee.

"The problem is still under consideration and will be discussed at further meetings of the advisory committee," an ODM statement said.

It was not revealed whether Gray is asking the importers to shave their programs. Before he left office, Arthur S. Flemming, former mobilization director, said the companies would be given a chance to revise their schedules if they were too high.

Flemming also said that if the end of the Middle East blockade brought a new flood of imports the ODM would recommend that the President invoke Section 7 of the Trade Agreements Act, the so-called national-defense clause.

Gray has not indicated whether he takes the same position as his predecessor. But failure to act to keep imports under control would bring a quick, loud demand for action by Congress.

Alberta Approves Exports

EDMONTON.—Gas from the Medicine Hat fields of Alberta will be exported to Saskatchewan despite objections from citizens of the area.

Medicine Hat residents feared exports would undermine the region's economy, which depends on an abundant supply of cheap fuel. But the objections were overridden by the provincial government.

The Saskatchewan Power Corp. is expected to receive its permit soon to move the gas. Flow will start early in 1958. The power company holds contracts with British Petroleums, Ltd., and Crescent Oil Corp., operators in the Medicine Hat area, calling for a gas supply of 210 billion cubic feet over a 20-year period. Another contract with Canadian Export Gas, Ltd., calls for 76.68 billion cubic feet over a like period.

watching WASHINGTON

. . . with Bertram F. Linz

Oil a busy subject for Congress

CONGRESS is building up a big record on oil. So many members are talking oil from so many angles that it is hard to keep up with them. The major areas of concern, however, have now been pretty well laid out. Here are some of the ways they are being brought to light:

Senate and House groups have gone into the European oil lift and the price hikes on crude and gasoline. Transfers of tankers to foreign flag are being studied by House members. The outlook for our tanker fleet is being studied on the Senate side.

Senate hearings on price discrimination have just ended. But House hearings on marketing practices of the major companies are just starting.

Natural-gas control was scanned briefly by a House appropriations subcommittee. It decided that the Federal Power Commission could get along without more money than it now has. Another group started the wheels rolling to resume research on oil shale. This time the Navy, not Interior, will get the job.

A couple of studies have resulted in bills. A probe of military "land grabs" brought a bill to the House aimed at protecting the oil under both upland and Continental Shelf areas taken over by the armed forces. A review of the merger situation developed a bill calling for advance notice to the Government of big-time mergers.

There's more to come. A general study of the industry will start soon. An inquiry is scheduled into the tax amortization program with a view to killing it so far as oil is concerned. And a new trade policy study will get under way.

Compact apparently in the clear

THE Justice Department will send Congress a full report on the Interstate Oil Compact next fall. And the cost will be a cut-rate $100,000—not the $600,000 asked last year to make the study.

The compact, so far, apparently will get a clean bill of health. There has been no sign that it has been used to create oil shortages or get higher prices, Victor R. Hansen, chief of the antitrust division, told a House committee recently.

The department was ordered 2 years ago to make annual reports on the compact. Atty. Gen. Brownell didn't want the job. He told Congress it will require an all-out million-dollar investigation of the industry. He asked over $600,000 for a start.

The House was all for the probe and voted the money. The Senate wasn't for it and allowed only $25,000. A compromise gave the department $100,000, and Brownell didn't ask for an increase this year.

Labor hushes revision moves

THE Senate racketeering probe has killed all chances for labor law revision this year. Labor leaders hope the subject won't even be mentioned. They are fearful the disclosures of corruption already made would lead to a tightening, rather than an easing, of the Taft-Hartley Act. Already there is talk of more states joining the 18 that have right-to-work laws, and even sentiment for a federal law along the same lines.

The Senate probe could go on indefinitely. Some 20,000 leads have been sent in, mostly by individuals not pleased with the way their unions are run. Most of these deal with the teamsters' union, but hardly any major labor group is free of attack.

Management also will come under the spotlight. Next year the committee is expected to go into deals between companies and unions, some to get an advantage over a competitor and others to get labor peace.

El Paso Officials Move Into Top Pacific Northwest Posts

HOUSTON.—El Paso Natural Gas Co. and Pacific Northwest Pipeline Corp. have accomplished a complicated management shift to integrate the two giant concerns.

All the changes stem from the recent acquisition of Pacific Northwest by El Paso Natural in a stock deal. They boil down to this:

Paul Kayser, president of El Paso Natural, and associates have taken over key management posts in Pacific Northwest.

Ray Fish, Pacific Northwest board chairman, has resigned from that post. But he and associates will move into the board of El Paso Natural at the company's annual meeting April 30.

The specific changes include:

... Kayser becomes board chairman of Pacific Northwest succeeding Fish. He also is an officer and director of several other companies in which Pacific Northwest holds interests.

... Howard Boyd, El Paso Natural vice president and assistant general counsel, becomes Pacific Northwest vice chairman. He succeeds C. R. Williams who remains on board. Stuart P. Silloway will continue as Pacific Northwest president but two board members, Robert R. Herring and Norman V. Kinsey, have resigned.

... In allied Pacific Northwest concerns, Kayser was elected board chairman of Northwest Production Corp., and president of Westcoast Investment Corp. C. L. Perkins, El Paso Natural vice president and president of El Paso Natural Gas Products Co., was elected president of Northwest Production Corp. Additional changes were made in the boards of Pacific Northwest Realty Corp., and Phillips Pacific Chemical Co.

What about Fish? . . . In announcing his resignation as Pacific Northwest board chairman, Fish described the changes as "both proper and desirable."

The moves, he said, "place the responsibility for operation and growth of Pacific Northwest Pipeline and Northwest Production Corp. in the management that now has control through stock ownership."

Fish and his associates have tentative plans to set up an international pipeline construction and engineering firm. Primary operations may be in Canada and South America. The new firm, Fish Engineering International, will be chartered in Switzerland.

But there still is much speculation about Fish's future with El Paso Natural. Through the recent stock exchange, Fish became the largest single stockholder in El Paso Natural. His holdings are listed at 211,104 shares, nearly twice the amount held by Kayser. Fish and four other former top executives of Pacific Northwest together hold more than 500,000 El Paso Natural shares or about 3 per cent of El Paso's stock. Other blocks are held by other men in the Fish organization.

Some of Fish's associates believe he eventually will gain control of El Paso Natural. They expect no struggle to develop between Kayser, now 70, and Fish, but believe Fish will move for control when Kayser steps down.

RAY FISH
... steps down, but not out of picture.

PAUL KAYSER
... takes helm of Pacific Northwest.

Tanker Costs Aired

Senate subcommittee gets review of foreign building

WASHINGTON—American oil companies are building tankers abroad and operating them under foreign flag for just one reason: lower costs.

It takes about $115 a ton more to build a 16,500-ton tanker here than abroad and about $100 a ton more for a 45,000-ton vessel. And it costs from $1,389 a day more for the smaller ship and $2,163 for the larger to operate under the American flag.

Only in the coastwise trade, from which foreign flag vessels are barred, can oil companies operate American-built tankers with American crews economically. In international trade they must compete with tankers of foreign companies and countries.

That was the picture given last week to Chairman Warren G. Magnuson of the Senate merchant marine subcommittee. Hearings are under way on a bill to promote the U. S. merchant marine. The present status and outlook for the U. S. tanker fleet will be studied first.

Five tanker-owning major companies were asked to supply data on the number of tankers, registry, taxes, operating costs and other matters. Officers of the companies were called to explain how they operate.

High-Pressure Well Finaled

CROWLEY, La.—Tidewater Oil Co. has completed the first successful high-pressure gas well in a South Louisiana field which had baffled operators just 2½ years ago.

The 1 H. Thibodeaux, in Church Point field of Acadia Parish, flowed gas at the rate of 4 million cubic feet daily through 10/64-in. choke. It also produced some distillate. Production is from perforations at 14,298-14,300 ft. and 14,314-16 ft.

A bottom-hole pressure of 12,395 psi. was recorded in a recent test *(The Oil and Gas Journal, April 1, page 80).* Tidewater reported a shut-in tubing pressure of 10,079 psi. and shutin casing pressure of 10,087 psi. Flowing pressure was 9,007 psi. on the tubing and 9,145 psi. on the casing.

How Ethyl Rated Gasoline in 1956

Area—	Premium RON	Increase	Premium MON	Increase	Regular RON	Increase	Regular MON	Increase
North Atlantic	98.2	0.9	87.8	0.8	92.7	1.6	85.7	1.1
Middle Atlantic	97.8	0.8	87.8	0.6	92.6	1.4	85.4	0.8
South Atlantic	97.8	0.8	88.1	0.6	90.7	1.0	84.9	1.1
Eastern Great Lakes	97.6	1.9	88.4	1.9	92.1	2.0	85.4	1.5
Kentucky-Tennessee	97.7	1.0	87.3	0.6	90.0	1.0	83.6	0.2
Gulf Coast	97.8	0.9	87.6	0.6	89.6	1.0	83.8	0.3
North Central	97.3	2.2	86.8	0.6	91.3	2.4	84.5	1.5
Southwestern	97.4	1.3	87.4	1.1	89.3	1.5	83.0	0.9
Northern Plains	96.4	2.1	85.6	0.5	88.8	2.4	82.6	1.0
So. Rocky Mountain	95.9	1.2	86.1	0.7	86.9	1.0	81.3	0.6
No. Rocky Mountain	94.1	1.0	84.4	1.1	85.2	1.1	80.1	1.0
West Coast	96.7	0.9	86.3	0.8	86.8	0.4	80.6	—0.2
United States	97.3	1.2	87.2	0.8	90.4	1.5	84.0	0.9

Pattern is erratic, but . . .

Octanes Still Moving Upward

ETHYL CORP. last week issued its second annual review of gasoline quality and came up with these observations:

. . . The octane race is continuing among refiners.

. . . Product improvement is following no uniform pattern.

. . . Timing of the next upsurge in octane numbers can be told only by a clairvoyant.

Ethyl researchers found that premium gasoline sold at service stations over the United States last year averaged 97.3 octane (research), up 1.2 from 1955. Regular gasoline averaged 90.4, up 1.5. Both averages were on a weighted basis.

Sharpest 1956 octane increase came in April and May. In those 2 months premium average gained 0.9 octane. In the year before octane increases of 0.5 occurred in February and June and July. In 1954 gains were recorded throughout the year.

Content pattern . . . These unrelated octane increases make it nearly impossible to foretell the timing for quality improvement. It's just as difficult to predict the pattern refiners will use to get higher octanes.

Ethyl's hydrocarbon analysis of different gasolines shows vast variations in components. For instance, in premium grades aromatics contents ranged from a high of 39.2 per cent to 10.2 per cent; olefins from 45.5 to 1.6; and saturates from 68.4 to 39.9. In regular grades, aromatics ranged from high of 34.8 per cent to a low of 9.9 per cent; olefins from 30.9 to 2.5; and saturates 84.2 to 54.3.

These statistics reveal that one prediction for 1956 failed to materialize. Refiners had believed that aromatics content would jump sharply during the year because of the expansion in catalytic reforming capacity. Instead both the aromatics and olefinic content of gasolines dropped for the year.

For premium gasolines the aromatics average dropped from 25.5 per cent in 1955 to 24.7 in 1956 and olefins went from 24.1 to 23.2. Percentage of saturates rose from 50.4 in 1955 to 52.1 in 1956.

Fuel cleaner . . . One of the marked changes in 1956 gasoline was the drop in sulfur content.

Sulfur compounds have a harmful effect on the lead susceptibility of gasoline, and their removal is a big factor in octane-improvement economics. The degree of sulfur improvement is shown in these statistics: For premium grades in 1955 sulfur content was 0.070 in winter and 0.062 in summer while it was 0.053 for both seasons in 1956. A slightly less sharp improvement was noted in regular grades.

The octane picture . . . Ethyl's year-end averages by areas of the country show a range of 4.1 octane numbers in premium and 7.5 in regular.

Highest quality premium and regular both were found in the North Atlantic area and the lowest in the high-altitude northern Rocky Mountain area.

Texas Checks Trucking Ties

AUSTIN. — The Texas Railroad Commission has broadened its inquiry into operations of common carriers and purchasers of Texas crude.

It is looking into ownership and operations of oil-trucking firms as well as pipelines. The commission gave common carriers and common purchasers until April 10 to file sworn statements on their trucking interests.

The order followed a request for such action during the opening phase of the hearing April 1-3 by Elton Hyder, Jr., floor general for the Texas Joint Committee on Pipeline Facilities. The committee represents five large associations of independent producers in Texas.

The producers suspect the inquiry will reveal that pipelines and purchasers are strongly represented in the ownership of oil-trucking firms.

They hammered hard and often 2 weeks ago at the economic hardship producers are forced to endure due to growing truck shipments *(The Oil and Gas Journal, April 8, page 63)*. Hyder pointed out that oil trucking had increased 637 per cent since 1948, while production had been hiked only 257 per cent since 1936.

Producers, he said, are getting up to 30 cents a barrel less than posted price for their oil due to higher trucking charges. They also lose large chunks of income during bad weather because the trucks can't get into the fields to take allowable production.

Hyder backed up these general contentions with detailed testimony from producer witnesses.

Following this up, Hyder asked that the commission order "the pipeline companies to state under oath any of their trucking interests." The commission did him one better. It asked this data from the purchasers, too.

If a carrier or purchaser has an interest in one or more oil-trucking companies, it must give the commission this information:

. . . Its ownership, percentage and type (including stock ownership, common control, contract, or otherwise).

. . . Name of truck line and principal office.

. . . Date of acquisition.

. . . Date operation began.

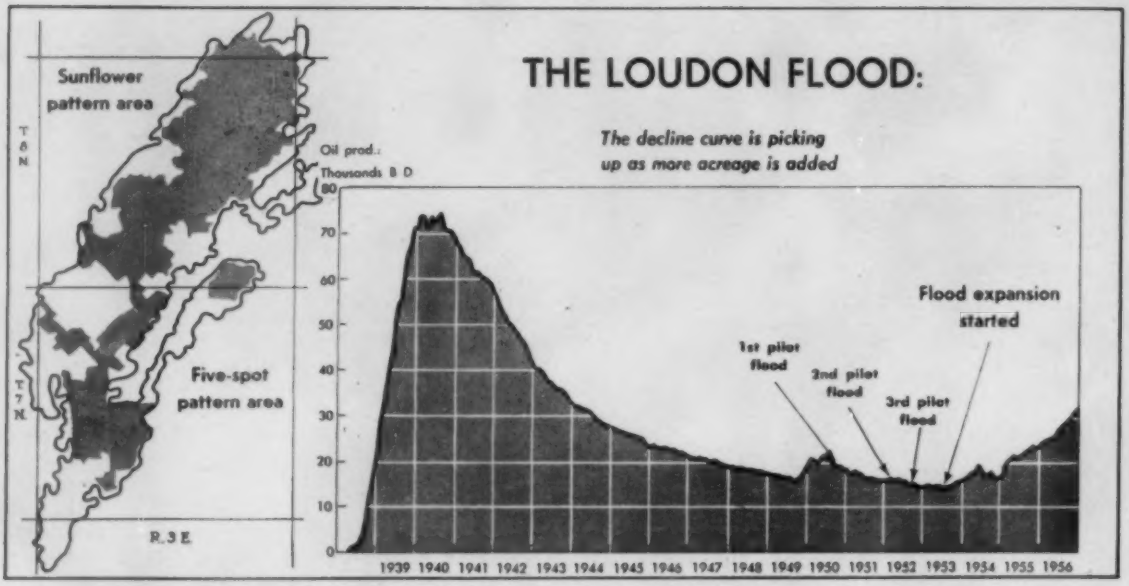
. . . General area of operation showing counties and T.R.C. district.

. . . Barrels trucked by year from 1948 through 1956.

. . . Gross and net incomes for years 1948 through 1956.

. . . Barrels carried per year, broken down as to oil moved, for a reporting common purchaser, and the amount hauled for others.

. . . Average charge per barrel for trucking.



New Techniques Paying Off at Loudon

WHAT Carter Oil Co. and other operators are learning at Loudon may go a long way toward improving water-flood techniques in other pools.

After 7 years of flooding the sprawling field in South Central Illinois, the project is paying off in two ways:

. . . **Output has more than doubled** in the last 3 years. The average is 32,000 bbl. per day. And it's still climbing.

. . . **New methods are saving money** for operators in the pool.

Production from the 12,800 acres under flood last year gained at the rate of 1,000 bbl. of oil per day each month.

The climax has not yet been reached in this success story. Carter and other operators hope to expand the flood to cover 18,000 acres of the 25,000-acre pool.

To rejuvenate the 20-year-old Loudon field, the operators have made the most of:

1. Multizone injection.
2. The sunflower pattern.

Three-sand inputs . . . Multizone injection equipment has made it possible to flood three pay zones simultaneously from only one injection well.

This has resulted in quite a saving, since several zones are under flood throughout most of the field.

Most of the 506 input wells are converted producers. To separate the reservoirs, Carter uses these tubing and packer arrangements:

. . . **For two-zone wells,** a method was devised for cementing stub liners in open-hole sections to permit segregated injection. Water is injected into the lower zone through 2-in. tubing packed off from the upper zone. The upper zone is flooded through the annulus between the casing and the tubing.

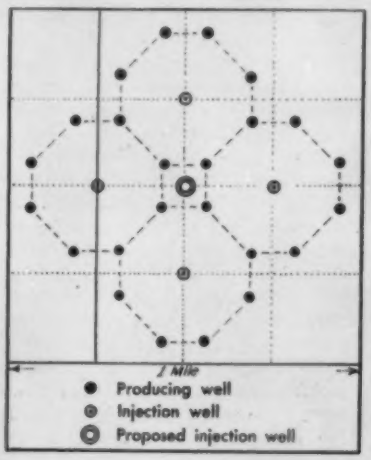
. . . **For three-sand inputs,** the lowest zone is fed through the 1½-in. tubing. Middle-zone injection is through the annular space between the 1½-in. and the 3½-in. tubing. The upper zone is flooded through the annulus of the casing and the 3½-in. tubing.

. . . **Where four-zone production** occurs, the operator drills twin wells. This method is also used where there are insufficient intervals between three zones.

Production at Loudon is from four horizons of the Chester series at 1,400-1,600 ft. and the Devonian limestone at 2,900 ft.

More than 90 per cent of the production comes from the Weiler, Paint Creek, Bethel, and Aux Vases zones of the Chester. Of these, the Weiler is the most important.

The Sunflower Pattern



Sunflower pattern . . . This involves drilling the producers on diagonal spots to form an octagonal design with eight producing wells around a central injection well (see chart). Each producer in this system is directly affected by two input patterns.

To flood 560 acres, eight inputs are needed initially for 32 producers. Another 80 acres can be added by drilling eight infill inputs later. These infills will help produce the oil which is in the squares formed where the octagonal patterns join.

Thus, in the life of the flood, it will take only 16 inputs for one section. Carter has not yet drilled the infills for the 9,120 acres covered by the sunflower pattern.

The sunflower method was first tested in 1938—just 1 year after the pool was discovered. At that time

TYPICAL LEASE in the Loudon field shows filter and pump house in center. Clockwise from the upper left are the tank battery, water source well, filter backwash pit, transformers and water storage tank, meter loop, and producing well. This is a bird's-eye view of the Bennie Shaw lease near St. Elmo, Ill.

gas was injected in the northern part of the pool, where the wells were drilled on 20-acre spacing.

Carter merely adapted the waterflood program to the octagonal pattern by converting the gas input wells to water inputs.

The southern half of the field is drilled on 10-acre spacing. Here the operation adapted the 20-acre five-spot pattern for water flooding, by converting every other producer to input wells. This requires 32 inputs for 32 producers in one section.

Handling the water . . . Carter is further cutting expenses and adding oil by:

. . . Automatic controls and safety devices at injection plants. Operating personnel has been reduced to only four men (two for each of the two 8-hour tours) to look after 12 plants.

. . . Hydraulic fracturing. More than 100 input and producing wells were fractured to increase injection and producing rates. So far no harmful effects have been attributed to the frac jobs.

. . . Decentralizing injection plants. Instead of one big central plant there are 12. These plants take care of about 125,000 bbl. of water daily.

Most of the water comes from the Tar Springs sand, found at 1,100 ft., and Chester-sand salt water.

The Tar Springs water requires many source wells. By building plants near the water wells, Carter is able to save on piping and electric power.

A large plant also would have tied up a big investment for a long time; however, Carter was able to modify new plants as they were built.

The "window" technique . . . Loudon was one of the first fields to use the multizone "window" technique in primary production.

Most of the 2,200 Chester-sand wells were completed by opening all zones into a common well bore. This was possible because of the similarity in depths, fluid characteristics, producing mechanisms, and initial pressures of reservoirs.

Casing was set on top the lowest zone with removable alloyed aluminum and magnesium sections opposite the upper producing sands.

After exposing the bottom zone, these "windows" were removed successively, by dissolving them or cutting them out.

Carter pioneered with insulation of casing strings from flow lines and other surface pipeline networks. This wards off electrolytic corrosion of the casing strings.

Peak production . . . Loudon is one of the largest discoveries touched off by the Illinois basin boom in 1937. Gas injection started soon after the pool was opened, and between 1938 and 1946, injection had spread to more than 13,000 acres.

The pool was averaging about 75,000 bbl. per day by the mid-1940's. Then began a steady decline which continued until the effects of water flooding were felt (chart).

In its 20 years, Loudon has yielded 193,000,000 bbl. of oil. Of this, about 176,000,000 bbl. came from the Chester series.

Carter sized up the floodability of the Weiler zone in 1950 with its first pilot—a 10-acre, five-spot pattern in the southern part of the field.

This was followed up by another Weiler flood the next year. This time the sunflower pattern was used. The third pilot was a 20-acre five-spot pattern near the center of the field. It was aimed at finding out how to convert multisand producers to water-input service.

The tests were all expanded until today 24 operators are involved.

Cooperative effort . . . Except for a few small areas, the gigantic Loudon project is being carried out in the absence of unitization—a rarity for such a large and intricate program as this.

Each section is flooded after first getting the consent of royalty owners to convert producers to input wells.

Carter engineers attribute the success of the big flood to cooperation, conservation, and adaptation of money-saving methods to situations as they are called for.

In addition to giving new life to an old field, the flood is helping Carter to plan and evaluate other floods.

SINCLAIR SCIENTISTS get set for atomic processing as . . .

Hottest U.S. Lab Opened

● Sinclair has two aims at new Harvey center: Evaluate atomic refining, find what happens to crude fractions

HARVEY, Ill.—The "hottest" industrial radiation lab in the country went into business last week with just two prime objectives: Find out the value of atomic refining and learn everything about petroleum fractions and what happens to them in use.

The new Sinclair Research Laboratories, Inc., here is the first industrial research facility to use fuel elements from an atomic reactor as its source of radiation.

This gives Sinclair a fourth tool in addition to heat, catalysis, and pressure for its long-range research refining. Sinclair researchers hope to come up with the answers on how radiation may be used in future processing techniques.

The second and equally important phase of the work will involve use of radioactive tracers to learn more about fundamental properties of petroleum fractions. The laboratory includes a full-fledged tracer section which will supply Sinclair with the tools necessary to carry on this work in the plant and in the field.

Built entirely by Sinclair, without any outside financial aid, this new facility provides an intensity of gamma radiation far higher than any other industrial lab today. The cost is quoted at about $375,000.

What is it? . . . The new building comprises office space, a counting room, a fully equipped laboratory for making and using tracers, an operating area from which radiation tests are controlled, and the cave where radiation takes place.

The cave occupies one corner of the structure. Separating it from the operating area, is a 5-ft. wall of high density magnetite concrete. Other walls, of ordinary concrete, are 79 in. thick.

Centered in the operating wall, a laminated radiation-resistant glass window 5 ft. thick gives full observation of the cave. From this position, the operator can withdraw the radiation sources from the 18-ft. deep water well and place them concentrically around the equipment previously set up for a given experiment. Master-slave manipulators allow the easy handling of smaller objects.

All process piping enters the cave through a labyrinth in the wall. Samples of material can also be introduced while the fuel elements are exposed through a dry materials port equipped with a moving belt.

Access to the cave is through a doorway instead of the conventional labyrinth. This opening is shielded by a door of magnetite ore encased in steel. This 5-ft. door rides on a monorail. An elaborate system of interlocking devices prevents opening the door unless the fuel elements are safely stored at the bottom of the water well. As a further precaution, a radiation detector locks the door if radiation levels in the case are unsafe. Even these favorable conditions require the presence of two men to open the door. Each man entering the cave takes with him a key which prevents the door from closing until the key is properly returned to its place outside the building.

The cave has one additional safety device. Should the radiation source be placed in such a position that it could not be returned to the well by normal means, all openings may be sealed and the entire cave may be flooded. An access plug in the thick concrete roof could then be removed and the radiation source could be returned to the well by long-handled tools, with water providing sufficient shielding for operators on the roof.

How safe is it? . . . The extremely conservative safety policies which governed design of this cave will permit use of the highest energy sources available.

When handling the four most powerful fuel elements obtainable which deliver 2½ million roentgens per hour at a 3-in. distance, the operator is exposed to less radiation in 2 or 3 years than he experiences in one average dental X-ray. A normal 1-minute X-ray fluoroscope examination is equivalent to 10 or 15 years' exposure behind the operating well.

It is difficult to equate the lab's capacity in safely handling fuel elements with the better-known cobalt-60. But the shielding built into this newest laboratory would permit the use of 3 million curies of cobalt-60 with complete safety to all personnel.

What are fuel elements? . . . Spent reactor fuel elements contain about 6 to 7 ounces of uranium, encased in aluminum jackets. During their use as fuel in a reactor, the uranium splits into many other radioactive elements which give off gamma rays.

When a certain amount of the uranium has fissioned, the element is no longer useful in a reactor. But it still represents a powerful radiation source. The radiation from such a "spent" fuel element comprises many more types of gamma rays than one given off by a single radioisotope, like cobalt-60. Fuel elements also give off gamma rays much faster than cobalt-60.

These rays are useful in affecting petroleum products and processes only

when they actually hit a molecule. Since the rays penetrate dense steel very readily, they obviously also tend to pass through the target material, with relatively few rays hitting a carbon or hydrogen atom.

This action is very much like throwing pebbles at an open-mesh wire fence. How hard they're thrown is not so important as how many plebbles are thrown in a given length of time. Hence, fuel elements "throw" handfuls of pebbles as compared with single ones "thrown" by individual isotopes. This gives a greater amount of useful radiation.

Why fuel elements? . . . Sinclair is the pioneer in using this radiation source. Several reasons governed the choice.

In the first place, fuel elements give substantially greater doses than any other radiation source now available. This laboratory will be working with a radiation intensity far and away more powerful than any other industrial center yet built.

Secondly, fuel elements come in a large size which can be used with conventional laboratory process equipment. Each element comprises an aluminum case 3-in. by 3-in. by 24-in. One of the four long faces is concave. Thus four elements can be grouped about a column to give a larger area of irradiation. This obviates the design of expensive scaled-down equipment.

A most important factor favoring fuel elements is one of practicality. When radiation energy reaches commercial application, it will have to be on a large scale. Large-scale radiation of this intensity will be available only inside or adjacent to nuclear reactors. The spent fuel elements emit the same type of radiation, namely a wide variety of gamma rays. Hence, this lab will use elements whose radiation will more closely approximate the type probably to be used some day in pay-off applications.

Another favorable factor is availability. Spent fuel elements are being made available to Sinclair on a loan basis by A.E.C. for the first time. But this is only the beginning. As the number of reactors multiplies in the future, vast quantities of these elements will become available.

The concept of using these elements in the absence of water shielding gives Sinclair a dual advantage. In bypassing the necessity of designing and building test equipment for underwater operations, the company is saving many dollars. The open-air exposure provides a second bonus in providing much higher radiation intensity.

What will Sinclair do? . . . In selecting an exclusive gamma-emitting source, the Sinclair research team, under Dr. A. I. Snow, will have a tool which does not make irradiated materials radioactive.

The penetrating power of gamma radiation will permit use of heavy steel process equipment designed for high temperature, high pressure operation. The choice of fuel elements will also give an intensity and variety of gamma radiation not available from isotopes like cobalt-60.

Sinclair's work is just beginning. Today it has installed four spent fuel elements which have been out of a reactor for several hundred days. These elements are roughly 1/10 as radioactive as the 20 to 30-day elements proposed for use later this year.

These elements will be supplied, and replaced as needed, by the Atomic Energy Commission's reactor at Idaho Falls, Idaho. The first elements came from Argonne pile in nearby Chicago.

Sinclair's work will follow many routes. In addition to fundamental studies in radiation chemistry, the research team will find out how radiation can aid known catalytic refining processes. The scope of the radiation source will permit pilot plant scale studies inside the cave.

In the long range, Sinclair expects to devise new processes not possible by heat and catalysts alone. It hopes to learn how many known processes may be carried out more readily and more economically by supplemental use of this fourth tool—radiation.

Right-of-Way Drilling Clipped

WASHINGTON. — Most western railroads now cannot drill for oil and gas on their rights-of-way.

That's the effect of a 5-3 Supreme Court decision last week in a case involving Union Pacific Railroad Co. A majority of the court held the Government retained the mineral rights when it granted rights-of-way to railroads to build their lines.

The ruling specifically applied only to the Union Pacific. Government authorities, however, claim the decision will apply to rights-of-way granted all other western lines between 1862 and 1875. This means the ruling affects 10,000 miles, or 500,000 acres of right-of-way between the Missouri River and the Pacific Coast.

Special land grants made to the railroads are not involved. There's a difference between rights-of-way and the land grants. The Government gave the railroads the rights-of-way for track sites and construction materials. The land grants were made to encourage building the roads. Some of the land was sold by the railroads to finance construction.

The ruling . . . The Union Pacific case originated in Wyoming.

The federal Government contested the railroad's right to drill on its right-of-way near Borie, Wyo. A federal District Court gave the railroad permission, and this was upheld by the U. S. Circuit Court in Denver.

Reasoning of lower courts was this: An 1862 law authorizing rights-of-way excluded "all mineral lands," but the Government didn't specifically reserve the subsurface oil and gas deposits.

The Supreme Court upset both the lower courts. Justice Douglas, speaking for the majority, said "there are no precedents which give the mineral rights to the owner of the right-of-way as against the U. S. We would make a violent break with history if we construed the law to give such a bounty."

Douglas also declared the right-of-way was granted for building a railroad and telegraph line and added: "drilling for oil on or under it is not a railroad purpose within the meaning of the law."

Repercussions . . . Union Pacific spokesmen said the company has not started any drilling operations which will be upset by the ruling.

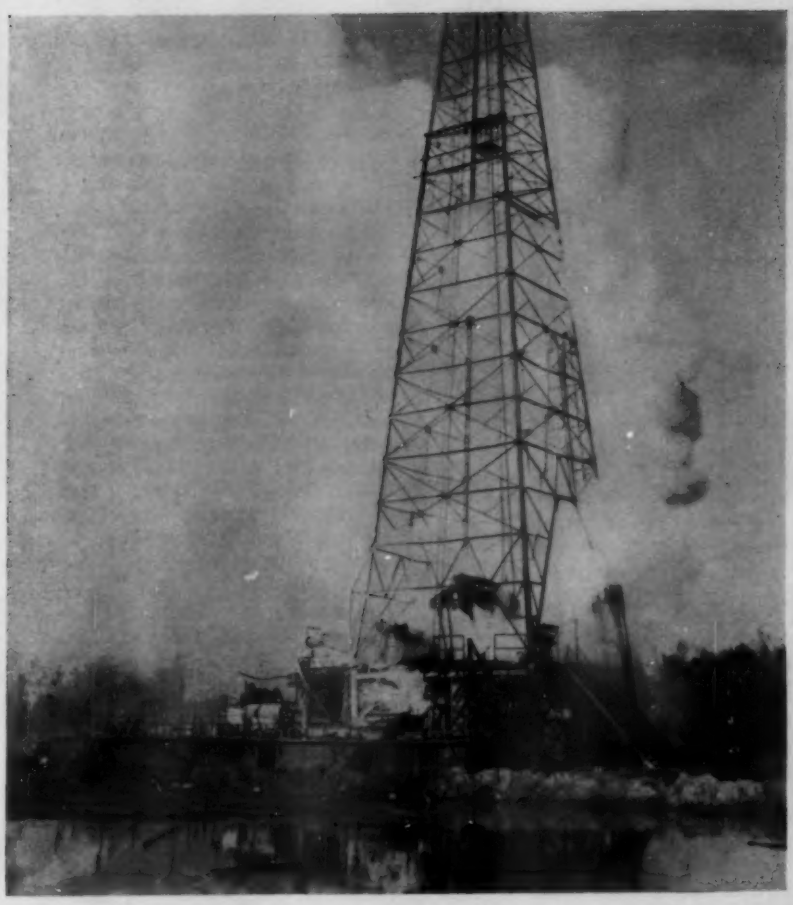
The railroad has oil income from royalties on wells drilled on land-grant areas and on property at Wilmington, Calif., bought years ago for industrial purposes.

Other western railroads with large land grants in old areas also said the decision will have little effect on their present oil and gas activities.

Wording of the majority opinion limiting use of rights-of-way to railroading activities, however, may pose a legal threat to Southern Pacific Railroad. This company has completed a products pipeline on its right-of-way from El Paso through Phoenix to Los Angeles.

Truckers, smarting under this possible loss of products business, months ago asked the Department of Justice to challenge this use of rights-of-way. They were advised to await outcome of the Union Pacific case.

Drilling Rigs Are Taking a Beating



All Over the Oil Patch

IN Oklahoma a rig drilled into an underground river (top left) and nearly fell into the crater that resulted.

In Louisiana a deep wildcat being drilled as a tight hole (above) hit a high-pressure gas and salt-water sand and blew out.

And in the Gulf of Mexico, the battered hulk of "Mr. Gus" (left) was washed by breaking waves as plans for salvage got under way.

The Oklahoma rig ran into trouble at only 465 ft. while on a development well in Harper County's Laverne pool. The driller noticed that his 20-in. surface pipe was sinking. He pulled the drill string and got the last joint out at midnight just as a 40-ft.-diameter hole opened in the ground. Dawn found the rig teetering on the edge of a crater 25 ft. deep.

The Louisiana well is British-American Oil Producing Co. and associates' 1 Intercoastal Shipyard, 7 miles east of Morgan City. The blowout preventers held when the bit hit a high-pressure sand at 13,857 ft. But gas and salt water were forced up the drill pipe, through the kelly and mud hose to the pump. A surge chamber in the mud pumps blew out. The gas caught fire and threatened to destroy the rig. But within 12 hours, the fire was out and the well under control. In spite of the serious threat, damage was slight.

"Mr. Gus" was given new hope last week. Salvage crews went to work to raise it from the sea. Plans call for possible rebuilding of the $3,500,000 mobile platform which capsized in 40 ft. of water April 3.

A derrick barge operated by Brown & Root, Inc., started pulling the piles which anchored the vessel to the gulf floor. Divers were sent down to hook onto smaller pieces of equipment scattered on the bottom of the sea. A powerful magnet was being used to retrieve drill pipe.

Industry briefs

Richfield Oil Corp. has won its race with the spring thaw on Kenai Peninsula of Alaska. The company spudded in its first test on the 71,680-acre Swanson River unit April 5, just ahead of the thaw which would have made it impossible to move a rig in. A swamp buggy is being used to transport the drilling crews between the drill site and the town of Soldotna.

The Bureau of Mines has established a core library at the Denver Federal Center. It contains 1,300 samples of cores drilled by the bureau and others throughout the western U. S. The samples represent about 700,000 ft. of drilled cores. Another library planned at Minneapolis will store cores from eastern and southern sections of the nation.

More students are preparing for engineering careers this year than at any time since 1948. The U. S. Office of Education reports nearly 243,000 are studying in accredited engineering colleges. This is nearly equal to the all-time high of 1947. Enrollment of senior students in engineering this year is up 20 per cent over 1955 when graduates numbered nearly 24,000.

The 1959 International Petroleum Exposition will be held in Tulsa May 15 to 24. The dates were chosen to allow visitors from more than 50 foreign countries to attend both the exposition and the Fifth World Petroleum Congress, to be held in New York May 30 to June 6, 1959. The exposition will coincide with the 100th anniversary of the Drake well at Titusville, Pa.

Spring thaws which are making roads impassable in Alberta and Saskatchewan have idled 60 of the 250 drilling rigs operating in the two provinces. It is expected another 100 may be affected within the next 2 weeks.

Goodrich-Gulf Chemicals, Inc., has become a victim of the nation-wide strike against B. F. Goodrich Rubber Co. The chemical firm has shut down its big synthetic rubber plant at Port Neches, Tex., which has a rated capacity of about 100,000 tons a year, and reduced output at Institute, W. Va.

Some 400 hourly paid workers were laid off at Port Neches. Goodrich-Gulf is owned jointly by B. F. Goodrich and Gulf Oil Corp. The firm's biggest customer is the idled Goodrich company.

GROVER KILGORE

WILLIAM T. POWELL

Kilgore, Powell Head Suppliers

PALM SPRINGS.—Grover Kilgore, vice president of Halliburton Oil Well Cementing Co., Duncan, Okla., was elected president of the Petroleum Equipment Suppliers Association here last week.

He succeeds Rainey Elliott, president of Jones & Laughlin Steel Corp., Supply Division.

William T. Powell, executive vice president of Continental-Emsco Co., Los Angeles, was elected vice president at the suppliers' annual meeting.

Chairmen of the association's four districts are: Paul Scherf, Alten Foundry & Machine Works, Inc., eastern district; John G. Staudt, Dowell Incorporated, Mid-Continent and Rocky Mountain district; M. E. Montrose, Hughes Tool Co., southwestern district; and W. T. Powell, Continental-Emsco, Pacific district.

The chairmen also serve as directors of P.E.S.A. Other directors of the association are:

Eastern district: Fred J. Spang, Spang & Co., director emeritus, and Mason B. Jones, S. M. Jones Co., director at large.

Karl Elliott, Acme Fishing Tool Co.; Rainey Elliott, Jones & Laughlin Supply Division; Jene Harper, Franklin Supply Co.; Lloyd Lanphere, Ajax Iron Works; Donald W. Mackie, Jr., Bradford Supply Co.; Frederick F. Murray, Oil Well Supply Division, U. S. Steel Corp.; Bernard P. McDonough, Parkersburg Rig & Reel Co.; A. W. McKinney, National Supply Co.; J. T. Murray, Midwest Supply Co.; John G. Seiler, Tube Turns, Division of National Cylinder Gas Co.; and H. Bernard Wehrle, McJunkin Corp.

Mid-Continent and Rocky Mountain district: Guy A. Thompson, Bethlehem Supply Co., director at large.

R. A. Baker, Franks Manufacturing Corp.; F. E. Bernsen, Lucey Products Corp.; W. L. Butler, W. C. Norris, Manufacturer, Inc.; Davis D. Bovaird, Bovaird Supply Co.; Lester W. Hall, Eastman Oil Well Survey Co.; S. J. Iverson, Iverson Supply Co.; Grover Kilgore, Halliburton Oil Well Cementing Co.; K. W. Lineberry, Black, Sivalls & Bryson, Inc.; M. G. McCool, American Iron & Machine Works Co.; S. P. Wallace, Maloney-Crawford Tank & Manufacturing Co.; and J. E. Webb, Republic Supply Co.

Southwestern district: Fred M. Mayer, Continental Supply Co., and Wallace D. Wilson, Wilson Supply Co., directors at large.

H. H. Allen, Cameron Iron Works; Ken W. Davis, Mid-Continent Supply Co.; R. G. Hamaker, Reed Roller Bit Co.; Ott Hammer, Dresser Industries, Inc.; Frank L. Hereford, Murray-Brooks, Inc.; Elliott Johnson, Schlumberger Well Surveying Corp.; W. H. Larkin, Larkin Packer Co.; L. A. Little, Lufkin Foundry & Machine Co.; George O'Leary, Houston Oil Field Materials Co.; R. H. McLemore, Otis Pressure Control, Inc.; Ray O. Shaffer, Welex Jet Services; and Richard E. White, Mission Manufacturing Co.

Pacific district: J. A. Crawford, Youngstown Steel Products Co.; E. S. Dulin, Byron Jackson Co.; and T. Sutter, Baker Oil Tools, Inc., directors at large.

James Bere, Axelson Manufacturing Co., Division of U. S. Industries, Inc.; J. L. Evans, National Supply Co. of California; Markley C. Brown, Hillman Kelley; Don Grubbs, Oil Well Supply Division of United States Steel Corp.; H. J. Hagn, Chiksan Co.; Harold E. Howard, Howard Supply Co.; Wendell M. Jones, Bethlehem Supply Co.; John J. Neale, Lane-Wells Co.; H. H. Peters, Technical Oil Tool Corp.; John J. Pike, Republic Supply Co. of California; and W. A. Wilson, Web Wilson Oil Tools, Inc.

Costly problem solved as . . .

New Method Combats Brine

TULSA.—Producers are armed with a new weapon against the old costly enemy of lime and gyp scale deposition in wells making water.

A new treating method prevents "gyp" deposits by injecting complex phosphate into the well during fracture treatment. Polyphosphate in granular form is blended with sand used as a propping agent which is suspended in the injection fluid.

When the fracture treatment is completed mixture of sand and solid phosphate is left in the producing channels of the well.

As production begins, water passing through the fractures dissolves a small amount of the phosphate. This dissolved phosphate then inhibits the deposit of calcium and barium minerals.

What's involved . . . The new method was introduced by E. N. Alderman and G. W. Woodard of Dowell Incorporated, in a paper presented before the secondary recovery and pressure maintenance committee of the Mid-Continent district of the A.P.I. Division of Production.

A typical fracture treatment consists of about 500 lb. of the polyphosphate. It may be used with either water or oil.

In place, the phosphate dissolves very slowly, but only very low concentrations are needed in the produced water.

In some cases, where deposition was a problem within a month or less, the new treatment has sustained production for as long as 6 months.

Application probably has a temperature limit because the solubility of the phosphate increases with temperature. Greatest temperature at which it has been used is about 130° F.

The problem . . . In wells making large amounts of brine, insoluable minerals often deposit out in the well bore, scaling up and plugging pumps, rods, screens, liners, and other bottom-hole equipment.

As a result, wells must be shut down frequently and cleaned out. Usually these deposits are only slightly soluable in acid and must be removed by mechanical means.

Deposits on screens, liners, or the face of the formation require either reperforating or underreaming. In some cases, the plugging extends into the formation far enough to require stimulation by fracturing.

After fracturing, these wells may enjoy only a temporary production increase, because deposits from the produced water may start plugging the sand pack in the fractures and make the well decline rapidly.

What it does . . . The complex phosphate acts as an inhibitor to mineral deposits. It does not actually keep these compounds from forming but slows down crystal growth. This results in colloidal suspension of particles too fine to cause plugging of deposition.

The inorganic compounds do eventually deposit from solution. But this is usually after the produced water is completely out of the formation and well system.

In a brine containing 5,000 p.p.m. calcium and 5,000 p.p.m. sulfate ions can be inhibited by only 5 p.p.m. of dissolved polyphosphate so that precipitation is prevented for at least 24 hours.

Damage Suit Asks Million

HOUSTON.—An oil-tool company is seeking $1,000,000 in damages from a rival firm accused of taking its top executives and trade secrets.

McCullough Tool Co. filed suit in U. S. District Court here against Great Lakes Carbon Corp. and a subsidiary, Great Lakes Petroleum Services, Inc.

The suit alleges Great Lakes Petroleum Services was organized following a conspiracy between J. T. Hancock, president of the parent company, and three men who were then employed by McCullough. Men named in the suit, all now executives of the rival firm, are Lester W. Toelke, R. W. Smith, and Glenn Fryer.

Pipeline briefs

Great Lakes Pipe Line Co. on May 1 will begin transporting 98-octane gasoline. Great Lakes earlier announced an increase to 97-octane gasoline, effective April 15. The company said a 97-octane grade will be accepted for consignment after May 1 to terminals where facilities and volumes offered are adequate to permit handling.

Skelly Oil Co. plans to build a 38- mile, 8-in. extension of its gathering system into southern Kiowa County, Kansas, to transport crude from Nichols field. The line will be operating early this fall. Skelly is purchasing crude which is now trucked from Nichols and other fields in the area.

The gas utility and pipeline industry paid $780 million in taxes last year, nearly 13 per cent more than the previous year. Net income was $597 million, compared with $524 million in 1955, the American Gas Association reports.

A new 10-in. crude line now car- ries Lake Washington crude to a barge-loading terminal at Port Sulphur on the Mississippi River in southern Louisiana. The 8.6-mile line was built by Service Pipe Line Co. and will carry 20,000 bbl. daily.

The system includes 3.8 miles of 6-in. gathering lines and connects to 10 leases operated by Mecom Petroleums and Placid Oil Co. The crude is shipped up the Mississippi to American Oil Co.'s refinery at Destrehan.

Cities Service Pipe Line Co. plans to start construction about June 1 on a 168-mile, 6-in. L.P.G. line from East Chicago, Ind., to Lowell, Mich. The line will be built and operated by Cities Service Pipe Line for Texaco-Cities Service Pipe Line Co., which will transport L.P.G. commingled with crude from Tulsa to East Chicago. Completion is scheduled by September 1. Contracts have not been let. With a single pumping station at East Chicago, initial capacity will be 8,000 bbl. daily. This can be increased later.

Transcontinental Gas Pipe Line Corp. will start another phase of its 1957 looping program around May 15 in South Carolina, Georgia, Alabama, Mississippi, and Louisiana. Transco awarded contracts to Sharman, Allen, Gay & Taylor, Inc., Houston, for 110 miles of 36-in., 16 miles of 30-in., and 13 miles of 24-in. The project includes 11 separate loops. Completion is expected in November.

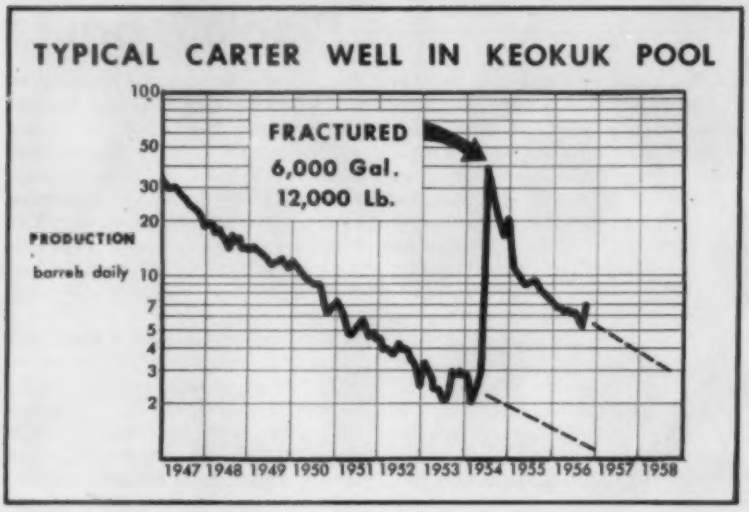
The contractor is just winding up two other jobs. They are 4 and 10-in. flow lines linking Pure Oil Co. production platforms 20 miles off Louisiana in the Eugene Island, Block 32, area, and 116 miles of 10-in. for Gulf Refining Co. from Lufkin to Mont Belvieu, near Houston. The Gulf line is part of a system to transport plant products from West Texas and New Mexico.

Yellowstone Pipe Line Co. will ex- tend its Billings, Mont. - Spokane, Wash., products system 25 miles to deliver jet fuel to two Air Force bases in the Spokane area. The 8-in. extension will be laid from the Spokane terminal to Geiger and Fairchild bases. Construction was scheduled to start last week. Engineers' Limited Pipe Line Co. has the contract. Completion of the $810,000 project is scheduled for May 15.

Also for Pipeliners . . .

El Paso Natural Gas officials are moving into top Pacific Northwest posts, but there's still speculation on future role of Ray Fish in the combined companies. He will be on El Paso Natural board and associates think eventually he'll make a move to assume active control (P. 86) . . . Texas Railroad Commission is broadening its inquiry into pipelining and crude buying in Texas. It's now looking into ties between pipelines and trucking interests (P. 87) . . . Supreme Court decision in Union Pacific right-of-way case may open Southern Pacific's products pipeline to legal attack from truckers (P. 91) . . . A pipeline system is among projects being pushed by French in big Sahara oil development (P. 100) . . . Argentina is studying a package deal of an international combine for developing its oil resources. Included are 2,670 miles of natural-gas and crude lines. The Arab world is stirred up over the U. S. tanker which sailed the Gulf of Aqaba to deliver crude for Israel's Elath-Beersheba pipeline (P. 102).

PLUS THESE TECHNICAL FEATURES: The Magic, a new kind of seagoing pipe-laying barge which uses production-line techniques, is ready for work in the open gulf (P. 112) . . . and Pipeline Petrol's construction report (P. 151).



Carter study shows how . . .

Oil Added by Fracturing

TULSA.—Fracturing is adding cheap reserves to marginal and semidepleted fields.

It's doing this by increasing production and extending the life of the fields. And the average cost of this "extra" oil is 32 cents a barrel.

These are conclusions of Carter Oil Co., based on a study of 142 Mid-Continent wells fractured several years ago.

Results of the study were presented here last week by J. B. Campbell before the spring meeting of the Mid-Continent district of the American Petroleum Institute's Division of Production.

Campbell's conclusions were based on a study of wells in semidepleted reservoirs where sufficient production history before and after treatment was available to give a reliable evaluation of ultimate recovery.

The study has had such a strong effect on Carter's completion program that 76 per cent of all sandstone completions or recompletions in the last 2 years have been stimulated by fracturing. Over-all success frequency has been about 74 per cent.

During the 7-year history of fracturing, Campbell said, about 155,000 treatments have been performed. Of this total, 47,000 were performed in the past year.

Of Carter's total of 1,098 fracturing jobs, 590 were done in the last 2 years. Costs of added reserves range from 7 to 53 cents a barrel, he said. Costs of increased daily production varied from $9 to $50 a barrel.

Carter's 142 wells on which the study was based were in 28 areas in 8 states. The company estimates it has already recovered 61 per cent of the additional oil.

Carter feels there is an optimum treatment size. In Oklahoma's Keokuk pool four wells were treated with less than 225 gal. per foot of sand. Ultimate additional recovery in these is estimated at 8,700 bbl. per well.

Four other wells treated with between 225 and 350 gal. per foot of sand have an average ultimate increased recovery of 25,600 bbl. per well. Six more wells treated with more than 350 gal. per foot of sand are expected to produce an additional 7,600 bbl. per well.

Carter's Results From Fracturing

No. of successful treatments evaluated	142
Average depth (ft.)	4,400
Gross production before (bbl. per day)	7
Gross production after (bbl. per day)	92
Current production (10-1-56), (bbl. per day)	11
Gross accumulated increase to 10-1-56	7,500
Gross estimated ultimate production (bbl.)	12,100
Cost of fracturing, dollars	3,900
Cost of fracturing per barrel increased oil, dollars	0.32
Cost of fracturing per barrel increase in potential, dollars	46

Caution Sounded

California urged to delay offshore royalty changes

SACRAMENTO, Calif.—The legislature is being advised to go slow in revising the royalty provisions for leases on state-owned offshore lands.

Hoisting the caution flag was James E. Cunningham, one of the authors of the original bill which opened up 135 miles of state-owned tidelands to exploration and development.

Cunningham recommended at least a 2-year wait before changing the royalty scales. He contended the state hasn't had enough time working with the bill to tell if it needs amending. "It might cost the state millions to make a mistake now," Cunningham said.

Cunningham's recommendations, however, stirred strong opposition on two important fronts. Assemblyman Allen Miller, leader of the move to amend the tidelands bill, and State Controller Robert C. Kirkwood countered that such a delay in not changing the act immediately would cost the state millions. Kirkwood is a member of the State Lands Commission which administers tideland oil matters.

Miller has a bill before the legislature making both proved and unproved state tidelands subject to a sliding royalty scale beginning at 12½ per cent. Proved acreage now goes for a sliding scale beginning at 16⅔ per cent and unproved for a flat 12½ per cent. Leases are awarded on a high cash bonus bid basis.

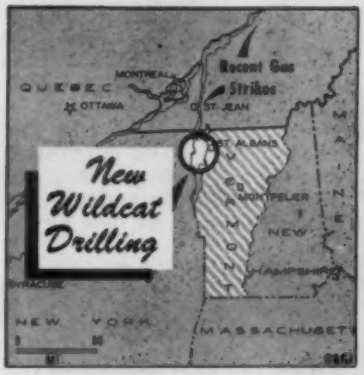
Assemblyman Joseph C. Shell, the other author of the disputed act, has announced he favors changing the royalty clauses of the act. Shell has introduced a bill similar to Miller's but making the graduated royalty rates discretionary with the State Lands Commission.

Transport Study Planned

WASHINGTON.—B. I. Graves of B. I. Graves Associates, San Francisco, was named last week to head a study of the nation's petroleum transportation.

Graves will head a group set up by the National Petroleum Council to make the survey, asked for last month by the Interior Department.

The 25-man committee will report on the extent of present, building and planned crude and product pipelines, barges, tank cars and tank trucks. It will show the capacity for moving oil from producing areas to refining centers and thence to markets.



Vermont Test Starts

First wildcat in state is sparked by Canada strikes

ST. ALBANS, Vt.—The first wildcat ever to look for oil in the state of Vermont was drilling ahead last week.

A heavy cable-tool rig operated by John Shaw, Kane, Pa., drilling contractor, is punching hole about 3 miles west of St. Albans in the Lake Champlain country of extreme northwest Vermont. The Isadore Yandow No. 1, the well may be taken to 5,000 ft.

Intrigued by oil seeps on their farms and plagued for years with the chore of burning gas off their water wells, the landowners started it all. Headed by Douglas Kelley, operator of a hotel at St. Albans, the landowners formed the Maquam Oil & Gas Development Corp. The landowner company has about 6,000 acres under lease.

The group interested the Peter Henderson Oil Co., New York, in the drilling prospect and assigned the acreage to the partnership composed of Henderson and George F. Baker, Jr. Since that time Henderson has acquired another 8,000 acres of leases which stretch up to the Canadian border. Shaw is drilling the first well on the Yandow farm under contract to Henderson.

Henderson formed his partnership with Baker a little more than 2 years ago after spending the postwar years as a roughneck in Texas. The company started looking for wildcatting prospects and now has production in Oklahoma, Texas, and Louisiana. It is drilling a 17,000-ft. test with Pure Oil Co. about 45 miles north and west of Casper, Wyo.

Henderson said last week he was attracted to the Vermont area by recent successes by Canadian companies just over the border in Quebec.

Processing briefs

Lion Oil Co. will continue its two-grade marketing policy by beefing up its premium grade. The El Dorado, Ark., firm began marketing the new fuel early this month in Arkansas and Louisiana, and introduced it to the remainder of its marketing area last week. Lion is a division of Monsanto Chemical Co.

Shell Oil Co. of Canada has let contract to Refinery Engineering Co. of Toronto for a $1 million epoxy resin plant near Shell's Montreal East chemical plant. Work will start immediately with completion expected within a year. Shell's chemical plant only recently started production of secondary butyl alcohol and methyl ethyl ketone, and work is under way on facilities to make detergent alkylates.

Ethyl Corp. has obtained a patent for manufacturing triethyl aluminum. It is an important ingredient in catalysts for olefinic polymers, especially high-density polyethylenes. Ethyl uses only aluminum, hydrogen, and ethylene as raw materials for the triethyl aluminum. The process involves moderate temperature and pressure and does not require special grades of aluminum.

Chemical & Industrial Corp., Cincinnati, and Clopay Corp. have dropped plans for a merger of the two firms. Officials of Chemical & Industrial Corp. said the firm will continue its normal business of designing and constructing plants for production of nitric acid, phosphoric acid, sulfuric acid, and processing of anhydrous ammonia.

D-X Sunray Oil Co. is coming out with a gasoline containing boron, one of the high-energy fuels. Called D-X Boron, the gasoline will replace the company's premium grade April 29.

D-X Sunray has been testing the gasoline in a special car with eight fuel tanks, seven of them containing premium-grade gasolines and one containing D-X Boron. Standard Oil Co. (Ohio) has been using a boron additive in its gasoline with considerable success.

American Oil Co.'s fire-damaged refinery at El Dorado, Ark., should be back on stream next week. The 40,000-bbl. plant was shut down last week after flames broke out in the vacuum tower of the crude unit.

Brea Chemicals, Inc., has postponed construction of a polyethylene plant at Union Oil Co.'s 109,000-bbl. Los Angeles refinery. Brea, owned jointly by Union and Koppers Co., Inc., will wait until Kopper's plant on the East Coast is operating.

Sun Oil Co.'s Sarnia, Ont., refinery, last refinery west of Montreal to operate on imported crude, is switching to Canadian crude. It is now taking 4,000 bbl. daily from Western Canada via Interprovincial pipeline.

Continental Oil Co. will start construction this summer of a 3,500-bbl. catalytic reforming unit at its Wichita Falls, Tex., refinery. The unit, costing about $1,500,000, is expected to begin operating by early 1958. Conoco's Wichita Falls plant has a crude charge capacity of 9,500 bbl. daily.

Also for Refiners . . .

Refiners will be interested in recommendations of House commerce committee for steps needed to stall effects of any future cut in foreign oil supplies (P. 83) . . . O.C.A.W. has won significant victory at Esso Standard's Bayway refinery. Independent local voted to affiliate with big international (P. 83) . . . Imports threaten to become excessive in next 6 months, Gordon Gray tells Cabinet Fuels Committee (P. 85) . . . Lower costs forcing American oil companies to build tankers abroad and sail them under foreign flags (P. 86) . . . Trend of the high-octane race is still moving upward, Ethyl reports in its annual survey for 1956 (P. 87) . . . Sinclair has opened the "hottest" industrial radiation lab in U. S. with two aims: Evaluate atomic refining and find what happens to crude fractions (P. 90).

PLUS THESE TECHNICAL FEATURES: How merging of three modern refineries in Michigan has paid off for Leonard (P. 104) . . . On the Job . . . In the Plants—an instrument for measuring asphalt viscosity, and an automatic switching device for feeding acid to cooling-tower water (P. 131) . . . PETRO-datics (P. 136) . . . COST-imating (P. 139) . . . The Foreman's Page (P. 140) . . . and Refiner's Notebook (P. 142).

Another pioneer is gone:

Death Takes Bill Skelly

TULSA.—The oil industry lost one of its pioneers last week.

William G. (Bill) Skelly, founder and chairman of Skelly Oil Co., died after an illness of several months. He would have been 79 on June 10.

Skelly was a man of two careers:

As an oil man, he formed and shaped a producing, refining, and marketing company in the Mid-Continent area and kept it together until his death.

As a philanthropist, he gave financial and moral support to hundreds of causes. They involved youth, farm, religious, health, industrial, educational, professional, civic, and charitable groups.

Hundreds of people both inside and out of the oil industry knew Skelly as a hard-working, conscientious supporter of good causes.

The same people also knew him for his leadership in the oil and gas industry—and associated the two. In fact, if any single person helped advance the public-relations program of the oil industry, it was Skelly.

Skelly tackled his civic duties avidly, and always practiced what he preached when he advised friends: "Don't let anything get your dobber down."

W. G. (BILL) SKELLY
. . . "Don't let anything get your dobber down."

Early in oil . . . Skelly was born in 1878 in oil country—Erie, Pa.—the son of an oil-field teamster.

At 16 he hopped a freight to Oil City and became a tool dresser. He later went to business school and then sold oil well supplies before heading west with the oil boom in 1900.

As an independent oil operator from 1903 to 1919, Skelly moved from Indiana to Illinois, North Texas, Kansas, and finally Tulsa. There he helped build "The Oil Capital" from a mudhole town to a clean metropolis.

Skelly made his big strike in the El Dorado, Kans., oil pool. That helped him become one of the Mid-Continent area's largest independents. He organized Midland Refining Co. in 1917 and merged it with other holdings into the present Skelly Oil Co. in 1919.

Skelly Oil Co. now has oil and gas production in 14 states, with holdings in other states. Three Skelly refineries operate in El Dorado, Kan., Longview, Tex., and Denver. The firm owns 12 natural-gasoline plants and has part interest in 5 others.

Skelly was active in company affairs almost until his death. He resigned as president of Skelly Oil in January to become chairman of the board.

Many activities . . . Skelly spread his investments into many fields.

He engaged in airplane building, pilot training school, trailer manufacture, ranching, radio and television. His far-flung interests led him into sports and at one time he was president of the Texas League's Tulsa Oilers baseball team.

Agriculture was his second love. A rancher, he headed a number of farm clubs and associations and encouraged agriculture by developing Skelly awards at fairs and agricultural conventions.

Tulsans knew him better than anyone. He took part in practically every major civic project ever undertaken in the city. He was known as Mr. Tulsa (a name he is said to have abhorred) and as Mr. Republican (he was Oklahoma national committeeman in 1924-28 and 1932-36).

Some of his gifts: In 1946 he donated 4,000 Bibles to missionaries. He gave a radio station to Tulsa University. He paid for half of Tulsa's new Skelly Stadium. He contributed $15,000 to an elementary schoolbuilding fund in El Dorado, Kans.

He was associated with nearly every major oil-industry association. These included American Petroleum Institute, Independent Petroleum Association of America, Mid-Continent Oil and Gas Association, Western Petroleum Refiners Association, Independent Natural Gasoline Association of America.

From 1925 until his death Skelly also acted as president of the International Petroleum Exposition in Tulsa, the largest oil show in the world.

LACT Spreading

Cities Service leases in Panhandle going automatic

AUSTIN. — Cities Service Oil Co. has approval of the Texas Railroad Commission to install equipment and tender oil automatically to pipeline from three leases in Panhandle field of Gray County.

The leases are the company's 160-acre Cunningham, the 160-acre Hughey "A," and the 120-acre Hughey "B."

The production operation on each lease, along with the tendering, will be automatic.

Production at each lease will be measured by positive-displacement meters. The oil then will be commingled at a common tank battery and run through a central LACT unit.

The LACT unit, located on the Hughey "B" lease, will monitor the oil for quality b.s. and w. content, pass it on to a sump tank if quality is alright, then pump it again through p.d. meters for the pipeline measurement.

More Tax for Avgas?

WASHINGTON.—A new federal tax on aviation gasoline is being studied by the administration.

Receipts would be used to pay for a new air navigation system which would cost close to $1 billion over the next 6 years.

Aviation gasoline now pays the same federal tax as automotive fuel. These taxes go into the highway program. The new tax would be in addition. No specific rate has yet been suggested.

The taxing of users of the airways, private, commercial and military, would lessen the drain on the Treasury, Louis S. Rothschild, undersecretary of commerce, told a House appropriations subcommittee.

"Our present thinking would seem to indicate that about the only equitable way of charging all users is through a fuel tax," Rothschild said.

Iranian Field Extended

Six-mile stepout at Agha Jari, Iran's largest field, has 20,000-bbl. daily potential; Gach Saran being developed

IRANIAN Oil Exploration & Producing Co. got the best kind of answer possible last week in its continuing efforts to define the limits of Agha Jari, Southwest Iran's biggest oil field.

Agha Jari 30, a deep wildcat test 6 miles northwest of the known limits of the field, is going to make a 20,000-bbl.-daily well. The bit on the test entered the Azmari limestone at about 6,400 ft., just about where geologists and geophysicists expected.

Agha Jari, discovered in 1937, has more than 40,000 proved surface acres and is by far the most important field in the southwestern area in which the international consortium operates.

Last year the field produced an average of 371,500 bbl. daily from 22 producing wells. Before last week's discovery the company said it could boost productive capacity of the field from 450,000 to 600,000 bbl. daily by adding a new pipeline and a fourth gas separation unit.

The rig which made the important extension discovery was one of five which the consortium company has operating in its area. Two of the rigs were being used in Agha Jari. One drilled Agha Jari 38, which was completed for a potential of more than 50,000 bbl. daily and is the best single well in the field.

Progress detailed . . . The Agha Jari discovery came just a few days after the exploration company and its sister, Iranian Oil Refining Co., revealed the progress of the operating companies last year. Here are the highlights of the report:

. . . Production averaged 534,000 bbl. daily during 1956, compared with 326,000 the previous year. This average has been stepped up in the first months of 1957 as Iran has taken advantage of the enforced shutdown of Arab fields caused by the Suez Canal closing. February topped 735,000 bbl. daily to bring the average for the first 2 months of this year up to 694,000 bbl. daily.

. . . Abadan processed an average of 233,000 bbl. daily in 1956, compared with 151,000 bbl. daily the previous year.

. . . More than $196 million was poured into Iran's economy by the oil operation during 1956.

More than $152 million of this was the country's income from exported oil and the value of oil delivered to National Iranian Oil Co. as royalty crude. Another $44 million represents added foreign exchanges brought into Iran by the operating companies to meet expenses.

. . . Gach Saran, southernmost field in the country, is being actively developed. The field's 31.8°-gravity crude is sour. Because of its low quality the field's four wells have not been produced earlier.

The increase in demand for heavy fuel in Europe is changing all this. At the end of 1956, Gach Saran was producing 40,000 bbl. daily, and an active drilling program is now under way to increase its output.

The exploration and producing company plans to build several 150,000-bbl.-daily separation and sulfur-extraction units in the field. Plans have been made for a 26 to 28-in. pipeline to move Gach Saran crude to a loading port.

The company expects to add three more drilling rigs to its operation this year. Two of them will be used to develop Gach Saran, discovered in 1928, and believed by some geologists to have the biggest crude reserve in Iran.

More Concessions Now Official

OIL companies operating in Venezuela now have the official word on four more concessions involved in February's bidding.

The Gaceta Oficial in Caracas detailed the successful land applications. The latest publication brought the total of new bids accepted by Venezuela to more than 350,000 hectares (about 741,000 acres).

The prize of last week's Gaceta publications was the ill-fated Block 10 in Lake Maracaibo. This time, on the fourth try, the semiproved lake acreage went to a group headed by the Venezuelan subsidiary of San Jacinto Petroleum Corp., Houston. Others in the group include Phillips Petroleum Co., El Paso Natural Gas Co., Sunray Mid-Continent Oil Co., and Pacific Petroleums, Inc.

Successful bids for this tract of almost 25,000 acres of underwater property were submitted at the first offering of Lake Maracaibo concessions last summer. The bidder was not able to put up the money at that time. Twice since then others have bid for the block, but neither was able to meet Venezuela's stringent new regulations on putting up bonus money.

Last week, in what is apparently an official award, the lake block went to the San Jacinto group.

Other official bids revealed were:

. . . Block 16 in the Gulf of Paria went to Venezuelan Atlantic Refining Co. Another 11,000-plus hectares (about 27,000 acres) in Barinas also went to Atlantic.

. . . 20,000 hectares (about 49,000 acres) of concessions in the State of Apure in extreme southwestern Venezuela along the Colombian border, went to a combine of Atlantic and Sun.

Drilling . . . The San Jacinto subsidiary, meanwhile, plans to start drilling by May 1 on a Lake Maracaibo concession it obtained in a previous deal. The acreage is near Mene Grande Oil Co.'s promising new discovery.

The test will be in 95-ft. water in a concession covering nearly 2,000 acres. It will be 6,000 ft. west of Mene Grande's Ceuta 1, which reportedly "discovered several hundred feet of Miocene and Eocene oil producing sections."

The San Jacinto subsidiary, San Jacinto Venezolano, C. A., has a 40 per cent working interest in the concession. Associates in the venture, with 15 per cent interest each, are subsidiaries of Tennessee Gas Transmission Co., Union Oil & Gas Corp. of Louisiana, Lion Oil division of Monsanto Chemical Co., and Murphy Corp.

The companies acquired the concession, along with other acreage in Venezuela, in a recent deal with Venezuelan Leaseholds, C. A. *(The Oil and Gas Journal, October 1, 1956, page 70).* Venezuelan Leaseholds is to receive 50 per cent of net profits from the concessions after the new operators have recovered costs.

French Push Big Sahara Development

● **Shooting for 40 per cent of domestic demand by 1960, government, banking combine budget millions; railroad is going in, pipelines are firmed up, new concessions issued**

FRANCE, already oil-hungry when the Suez Canal put her on a strict petroleum diet, is now eying troubled Algeria like a starving man staring at a table heaped with food.

The trickle of oil found by the French companies deep in the Sahara Desert could (the French say) become a good-sized stream.

Sahara oil in large quantities could solve a good many French problems. It could relieve France's almost total dependence on oil from the Arab Middle East where she is far from politically popular. It could free France from any prospect of a return to the rich diet of expensive dollar oil from the Western Hemisphere if the Arab world should again throttle her normal supply.

But, France has far from won her battle for political dominance in an Algeria seething with revolt. The oil discoveries have come at a time when they are almost certain to be prime targets of the Algerian nationalists fighting to be free from the French.

Visions of an oil supply have pushed political problems to the background. France is already embarked on the ambitious and costly project of getting that oil to the Mediterranean. At the same time, efforts to find more oil are being intensified.

Here are the latest developments:

... The government in Paris has approved multimillion-dollar programs for pipelines and extensive further drilling in the Sahara.

... French banking circles have formed a combine to back Sahara development of oil and other minerals to the hilt.

... Three companies with oil or gas discoveries in the vast desert wastes of the Sahara are stepping up their efforts in terms of both equipment and money.

... Another 44,200 sq. km. of exploration acreage in the Sahara has been granted by the government, bringing two more companies into the effort.

... A railroad is being built to meet the initial small-diameter pipelines planned to bring oil north from both Hassi Messaoud and Edjele.

The government ... The French Government has a major interest in every company that is looking for oil in Algeria. In some cases this interest is shared by the Algerian Government, but it is direct government interest nevertheless.

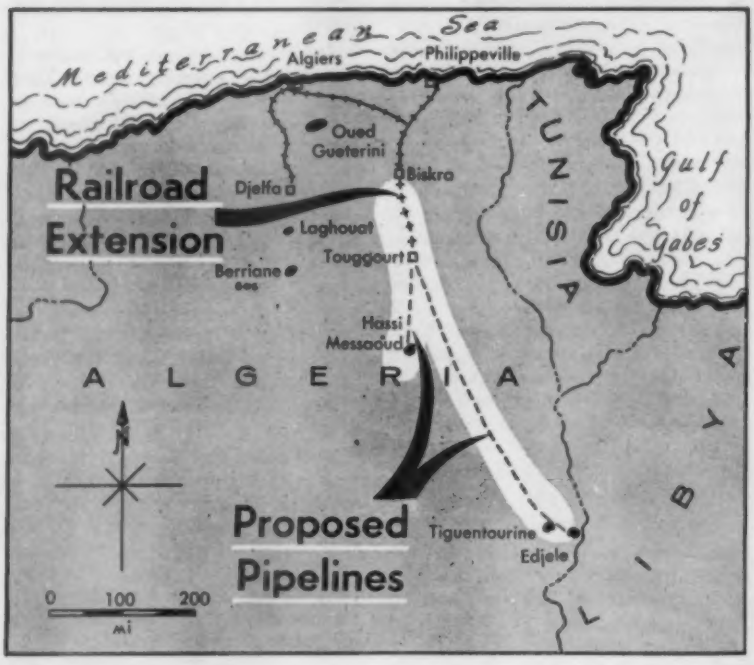
Shortly after bald, dynamic Maurice Lemaire, State Secretary for Industry, paid an on-the-spot visit to the Sahara wells he was back in Paris prodding the French Parliament into action. Lemaire is experienced at this sort of thing. He is probably best noted for putting the war-damaged French railroads back into operation.

At Lemaire's prodding the parliament approved:

... A $650 to $800 million plan to develop Algerian oil. Lemaire told the government this plan should give France enough oil from Sahara by 1960 to meet 40 per cent of her demand.

The long-range plan calls eventually for another 350 wells and for a 20-in. pipeline directly from the producing fields to either the Algerian or the Tunisian coast. The latter would be much shorter but would require Tunisia's approval.

... $6 million to be spent immediately on a short-term basis. Lemaire will sink this much into two 10-in. pipelines from Hassi Messaoud and Edjele to the railhead at Touggourt (see map). Lemaire believes the intensive development planned by the companies which discovered these fields will produce at least 95,000 bbl. daily by the end of next year. This pipeline-rail system would move that oil to the sea.



The bankers ... French banking circles have moved into the picture to add their chips to those being supplied by the national treasury.

Here again there will be government participation. The bankers have completed their plans to form a new company, Cie. Francaise du Sahara. The company's prime purpose will be to finance exploration for oil and other minerals in the Sahara, and to put up money for development of that already discovered.

The French Government's African Industrial Bureau will take part in the new company. This agency is headed by Louis Armand, director of France's nationalized railway system, the job once held by Lemaire.

Reports from Paris indicate that Henri Bonnet, once French ambassador in Washington, may head the new company.

The banking houses involved in-

clude Banque de L'Indochine, Laxard Freres & Cie. Credit Lyonnais, Banque de Paris et des Pays-Bas, Union Europeanne Industrielle et Financiere, Rothschild Freres, and Bank de L'Union Parisienne.

The new acreage . . . To add to the work already being done in the Eastern Sahara, the government last week gave three companies concessions over another 44,200 sq. km. The concessions are for 5 years and specify minimum sums the companies must spend in this period.

The largest block of land, broken into four separate concessions, is about 33,000 sq. km. It went to Cie. d'Exploration Petroliere, in which the British Petroleum Co.'s French affiliate, Francaise des Petroles BP, holds an interest of a little more than 2 per cent. Control is in the hands of the French Government's Bureau de Recherches de Petrole.

The four concessions are Hassi Tankort, 11,200 sq. km.; Temejide, 6,400 sq. km.; Timellouline, 5,950 sq. km.; and Hassi Imoulaye, 9,740 sq. km.

The companies must spend at least $3 million on the first concession in the 5-year term, and lesser, but still specified amounts, in the others.

A 6,000-sq.-km. concession along the Libyan border went to Cie. de Recherches d'Exploitation de Petrole du Sahara (C.R.E.P.S.). The company must spend $1,680,000 in 5 years.

C.R.E.P.S. was the first to hit pay dirt in the Sahara with its discovery at Edjele *(The Oil and Gas Journal, February 13, 1956, page 95, and May 21, 1956, page 145)*. The Royal Dutch-Shell group holds a 35 per cent interest in this company.

The third concession, Irharhar, covers 5,200 sq. km. and is located near the Issouance concession on which C.R.E.P.S. made the Edjele discovery. It went to Cie. des Petroles d'Algerie which must spend at least $1,176,000 on its work in the initial 5-year term of the concession.

The railroad . . . Typical of the urgency in France's efforts to tap Sahara's oil is the railroad project that got under way last week. The French aren't waiting for the pipelines to bring out the oil that is already being developed.

Last week, work started on a standard-gage railroad from the railhead at Biskra to Touggourt, 135 miles to the south. The new trackage will supplement the narrow-gage road now in use between these two points. The new rails will carry tank cars north from Touggourt to Philippeville on the Mediterranean Coast. The French expect those rails to be carrying Algerian oil in the near future.

GOOD GAS shows 60 miles below Laghouat will soon bring company for lonely rig of Cie. Francaise des Petroles Algerie.

While the planned pipelines are being built from the two fields north to Touggourt, tank trucks will link the railroad and the fields.

This truck-railway system of transporting the Sahara's oil, as well as the pipelines with which the French plan to replace this system, are the vulnerable spots in the whole scheme.

The new Algerian oil is deep in the desert region of the country in an area that is almost uninhabited. It is far removed from the troubled political area where a large part of the French army is now scrapping with Algerian nationalists.

The transportation route, however, must pass through areas that are not so immune to political and military disturbances. The railroad and the pipelines that will follow are almost certain to be prime targets of the nationalist forces fighting the French. As such they will be just as vulnerable as pipeline systems have proved to be in the Middle East.

Drilling plans . . . The three principal companies now engaged in active exploration in the southeastern Sahara region all plan to more than double activity this year.

Societe Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal) will drill at least six more wells at Hassi Messaoud, the company's major discovery *(The Oil and Gas Journal, December 31, 1956, page 104 and February 18, 1957, page 118)*.

C.R.E.P.S. plans to have 10 rigs running in its concession area. Four will be used in the west and the other six in the Edjele region. Of the 10, C.R.E.P.S. says six will be used for wildcatting and the others for development drilling. The company may add more rigs to the operation if findings warrant more-intensified drilling.

During 1956, C.R.E.P.S. drilled six wells at Edjele, confirming not only the shallow producing formation found at about 1,475 ft. in the discovery, but deeper productive sands as well. These deeper sands are oil-bearing, but the company has not completely evaluated them.

About 42 miles to the west of the Edjele development, C.R.E.P.S. has drilled two holes at Tiguentourine. The first found a pay zone at about 1,640 ft. before it was shut down. The second well tested a sand at 2,675 ft. which produced more than 32 bbl. of very light crude an hour. This well also found gas formations which tested from 75,000 to 120,000 cu. ft. an hour.

A third test is now being drilled 10 miles north of the two previous wells at Tiguentourine.

The Edjele crude is compared by the French to gas oil. It is sulfur free and has a very small percentage of paraffin. Tiguentourine crude is even lighter. All diesel engines in the region are now using this crude as fuel. C.R.E.P.S. says this amounts to about 65 bbl. daily and means a monthly saving of $6,000 for engine fuel at the cost of moving it into the desert from Algiers.

Cie. Francaise des Petroles Algerie, the third major company at work in the Sahara region, recently doubled its capital expenditure to step up its activity. This Algerian subsidiary of France's biggest oil company is working jointly with SN Repal in the area to the north and west of both Hassi Messaoud and Edjele where both companies have holdings.

South-southeast of Laghouat about 60 miles, C.F.P.(A) encountered three gas zones totaling 174 ft. between 6,993 and 7,301 ft., but the rig ran into mechanical trouble and drilling was suspended. A second test about 8 miles to the west is now being drilled (see picture).

Argentina Studies Bids

International combine offers package deal on building program; 2,670 miles of natural-gas, crude lines included

A 33-COMPANY combine last week offered Argentina a $268,000,000 package deal on an energetic oil development program that includes laying 2,670 miles of natural gas and crude lines.

The bid was made by contractors and suppliers from seven countries.

It was the government's payoff on efforts to get know-how and equipment on credit for the state oil agency, Yacimientos Petroliferos Fiscales (Y.P.F.). This had been one of the country's chief aims since prospects for new concessions for foreign oil companies died with the Peron regime in 1955.

Fourteen other companies tendered bids in Buenos Aires and one in New York on individual phases of the Y.P.F. plan. These bids were far overshadowed by the combined offer.

The combine, identified as the International Contractors and Suppliers Association, has an effective stick for getting a quick yes or no from the government. It has an option on 400,000 tons of essential steel plate for pipelines. The group must have an answer before this option expires in 30 days.

The government had asked for a 120-day period to decide on the bids. Gen. Alfredo Intzaugarat, Y.P.F. president, said he hopes for a decision within a month due to the urgency.

Tulsan a leader . . . Half the $268,000,000 equivalent would be covered by European Payments Union funds, 30 per cent by local Argentine money, and 20 per cent by U. S. dollars.

John Williams, one of the leaders in the combine, said U. S. companies could not by themselves compete with low terms offered by European firms. These were 15 per cent down, 15 per cent on delivery, and repayment of the balance over 7 years at 6 per cent.

His firm, Williams Brothers Sudamerican, Ltd., a subsidiary of Williams Brothers of Tulsa, is one of the two U. S. companies in the combine. The other, International Standard Electric Co., is a combination of telecommunications equipment suppliers.

Among the other members are Costain John Brown, Ltd., Britain; Schneider Enterprises, France; Ansaldo, Italy; Werkspoor, The Netherlands; Cockerill-Ougree, Belgium; and Sacem, Argentina.

What bids cover . . . The bid covered construction of a 1,115-mile, 24-in. natural-gas pipeline from Campo Duran to Buenos Aires; a 930-mile crude line from Campo Duran to San Lorenzo; and a 625-mile, 12-in. crude line from Mendoza to San Lorenzo.

U. S. firms bidding on an individual basis for various parts of the Y.P.F. program included J. Christenson Financial Corp.; Bartlett Oil & Gas Corp.; Hood Construction Co. & Associates; and North American Utility & Construction International Co.

Four U. S. companies and one Argentine company also submitted bids for drilling 40 wells on Tierra del Fuego.

Y.P.F. in New York said Barthe Oil & Gas Co. of California asked cost plus 25 per cent and one-fifth of production for 10 years. Laughlin Porter Co. in a joint bid with Ecofisa, a domestic firm, bid an average of $155,000 per well.

Loffland Brothers of Tulsa scaled its bid to U. S. drilling prices. Santa Fe Drilling Co. of California bid for the entire contract. Terms were kept under wraps.

Pergeo, S.A., a domestic firm, set its price at an average of $750,000 per hole.

Y.P.F. hopes to raise crude production to 170,000 bbl. daily within 3 years with its program. In 1956 Y.P.F. produced about 70,000 bbl. daily.

Considerable production is shut in due to lack of transportation. With new pipelines, Y.P.F. hopes to reduce the $100,000,000 per year cost for oil imports.

Subsidiaries of Royal Dutch-Shell and Standard Oil Co. (N. J.) and two domestic firms produce the country's remaining 13,000 bbl. daily. Output is slowly falling due to a lack of new concessions.

Aqaba Delivery Stirs Arabs

LAST week a United States flag tanker sailed peacefully up the Gulf of Aqaba with the first load of crude for Israel's Elath-Beersheba pipeline. The reaction from two quarters was immediate.

Israel hailed the occasion with the announcement that work will start promptly on a 16-in. extension of the line from the gulf, pushing it on to the Mediterranean.

In the first blush of success with its ambitious plan for bypassing the Suez Canal, the country could also point happily to these factors:

. . . A big step toward establishing Aqaba as an international waterway had been taken.

. . . Continued tanker trips through the gulf would take much of the sting out of the Israel boycott by Arab states and boost Israel's dream of major crude lines across the country. This dream is an important one in Israel's long-range survival plans.

International incident . . . But Israel's jubilation over the development might well be premature. A host of other political and economic implications were not long in rearing their heads.

The crude had hardly stopped pouring into the offshore unloading lines out in the gulf before the Arab states were reportedly putting together a formal protest to the United States over what they termed "violation of Arab territorial waters." Egypt's semiofficial Middle East News Agency carried the story of this Arab reaction.

It also was reported that the first Egyptian military force since the Israeli evacuation was being deployed in the Gaza Strip.

The shipment . . . The tanker which set off the furor was the T-2, Kern Hills, which delivered 15,500 tons of Middle East crude through twin loading lines at the marine terminal.

Israeli National Oil Co. has the Kern Hills under long-term charter. The ship is owned by Fairfield Steamship Co. and is operated out of New York by North Atlantic Marine Co.

Israel did not disclose the source of the crude, but reports from the Middle East indicate it is Iranian.

Israel's 135-mile, 8-in. line from Elath to Beersheba is to be tested this week. It will start taking crude 10 days later.

The 16-in. extension will be about 40 miles long. The Mediterranean terminal will be at Ashdoth-Yam, a few miles north of the Gaza Strip and near the historical ruin of Ascalon. The route passes near Heletz field.

Tankers will carry crude from the Mediterranean terminal to the Haifa refinery about 90 miles to the north. The Elath-Mediterranean system will have a 40,000-bbl. daily capacity, about two-thirds of domestic demand.

Iran to Drill Qum

Rumors of Italy deal ended as $17 million set for job

IRAN'S Shah made it official last week to the tune of $17 million. National Iranian Oil Co., not the Italians or anyone else, will develop the oil find at Qum, 75 miles south of Teheran on Iran's central plateau.

The Iranian Government announced last week that $17 million has already been set aside for development drilling at Alborz and for the purchase of a small refinery to meet domestic needs in the area.

A week previously, the Iranian Government broke a long silence to slap down persistent rumors originating in Rome that the Italian Government's Ente Nazionale Idrocarburi had made a development deal with Iran to take over the Qum operation *(The Oil and Gas Journal, April 8, page 87).*

In spite of the Iranian Shah's repeated statements that the Qum area, outside the International Consortium's operating sphere in Iran, would be developed by Iran alone, the press reports of an Italian interest in Iran continued to circulate in Europe last week.

Barbados Search Suspended

Gulf Exploration Co. has temporarily backed out of the British West Indies island of Barbados after drilling five wells in the past 7 years without finding commercial oil.

Gulf Oil Corp. officials in Pittsburgh emphasized last week that the operations were being suspended for further study—not permanently. Gulf, which has a concession covering about half the island's 166 sq. miles, wants a new concession covering the entire island.

About 2 years ago British Union Oil Co., Ltd., was granted the acreage not held by Gulf, but has presumably surrendered the concession.

At least three of Gulf's five wells on Barbados had gas shows, but none found oil in commercial quantities. One gas well was sold to the government-operated Barbados Natural Gas Co.

Costa Rican Test Abandoned

Union Oil Co. of California is abandoning one Costa Rican test and preparing to spud another.

Company officials announced Union's sixth drilling venture in the country, the 3 Cocoles, has been abandoned. But 4 Cocoles will be spudded soon on the same structure. The 3 Cocoles was carried to 5,000 ft. without any shows.

Union workmen, meanwhile, are building an access road to a new location near the town of Limon on the Caribbean coast of Costa Rica. Union eventually plans a test there.

Farmout Deal Ended

Kewanee leaves Havana as Ted Jones continues hunt

CUBAN KEWANEE OIL CO. has pulled out of its farmout deal with United Cuban Oil, Inc., in the 110-bbl. daily Jones field in Havana Province.

The company, which will continue its other Cuban operations, broke off the agreement by not paying the second installment of $450,000. Cuban Kewanee's first installment of $200,000 was made last year.

The deal gave Cuban Kewanee 82½ per cent of Jones field production. The company spent about $1,000,000 on a drilling program before dropping the project.

United Cuban, headed by Ted Jones, West Coast independent, took over some $250,000 in equipment from Cuban Kewanee. It will continue drilling in an effort to develop shallow production. If successful, the company plans to use profits to go for deeper production at around 7,500 ft.

United Cuban's deepest test so far was 13 Kewanee-Jones, abandoned at 7,984 ft. due to lost circulation. The company's 2 Cuban Juanita, east of Jones field, was abandoned at 7,515 ft. after noncommercial shows. The well offsets the No. 1, which was the second discovery on Cuba's north shore and which currently produces 30 bbl. daily.

Kuwait-Iraq Talks Postponed

The Shaikh of Kuwait has called off talks with Iraq on proposed water and oil pipelines until an old border dispute is settled.

Under a tentative proposal, the Iraqi Government would approve a scheme for piping Shatt-el-Arab water to Kuwait. The shaikhdom, in turn, would grant permission for Basrah Petroleum Co., an affiliate of Iraq Petroleum Co., Ltd., to build a pipeline to a deep-water terminal in Kuwait.

Basrah normally has a limited production of 186,000 bbl. daily from Zubair and Rumaila fields in southeast Iraq because only shallow draft tankers can load at Fao.

———World briefs

The drilling barge built in West Germany for Abu Dhabi Marine Areas, Ltd., is due to be launched this week.

After trials, the barge will be towed to the Persian Gulf for a well 20 miles off Das Island. Cie. Francaise des Petroles owns one-third of Abu Dhabi Marine Areas and British Petroleum Co., Ltd., two-thirds.

Turkey is considering amendments to its petroleum law which will permit refining of duty-free imported crude for reexport. The present law covers only refining of domestic production. An agreement for a 65,000-bbl. refinery recently was signed between the government and Socony Mobil Oil Co., Royal Dutch-Shell, Caltex, and British Petroleum Co.

Three U. S. geophysical companies are pooling their resources for international geophysical operations. National Geophysical Co., Inc., Dallas; E. V. McCollum & Co., Tulsa; and Continental Geophysical Co., Fort Worth, have formed NAMCO International.

The new firm is headed by John Gillin, president of National Geophysical. Headquarters are in Dallas. Each of the three affiliated companies will continue to operate independently in the U. S. and Canada.

Conorada Petroleum Corp. has a rig in transit for a wildcat test on its 36,000 sq. mile concession in British Somaliland. Drilling is expected to begin by midyear in the southeast part of the county near the Ethiopian frontier.

Jamaican Stanolind Oil Co. had a rig in place last week for spudding in its second wildcat in Jamaica. The test is Cockpit 1, located in Trelawny Parish about 16 miles south of Falmouth on the north coast. The rig, capable of going to 14,000 ft., was moved from 1 Santa Cruz, a dry hole in St. Elizabeth Parish about 40 miles south of the new location. The concession is a farmout from Base Metals Corp.

Chemical Construction Corp. (Chemico) will design a new ammonia plant for Befu Chemical Co., Ltd., in Japan. Site is on the southern end of Honshu island overlooking Befu harbor. Chemico has contracted to furnish basic engineering services for gas-generation facilities, using the Texaco process for partial oxidation of oil.

SPECIALTY PRODUCTS loom important in the new combined Leonard company. Roosevelt is a leader in the field of aromatic chemicals, and solvent naphthas which are fractionated in this battery of columns.

LATEST ADDITION to the Leonard processing system is this Ultraforming unit, which includes hydrodesulfurization of feed stock.

How to Integrate Three Modern Refineries Into One Better One

Chief gain: Processing units maintained more nearly at capacity, on feed stocks more ideally suited to each operation

by George Weber
Refining Editor

THE independent refiner today faces two important operational problems. He must remain competitive on product quality by installing and maintaining a wide variety of modern processes. He must, at the same time, retain a flexibility which permits adjustment of product yields to meet the best over-all return in a market which reacts to seasonal and other fluctuations.

Three refiners in Central Michigan had been showing a measure of success in meeting these requirements independently over a large number of years. But their specific problems were not the same. From a processing standpoint, each refinery had facilities not shared by the others. Each company specialized in different types of products outside the major fuels.

Logic argued that an integration of these facilities would result in a new high level of economy, product quality, flexibility, and product diversification. The merger which resulted is a sound success story.

The companies were Leonard Refineries, Inc., of Alma; Mid-West Refineries, Inc., also of Alma; and Roosevelt Oil & Refining Corp. of Mount Pleasant, about 19 miles to the north. On December 1, 1955, these companies officially merged under the Leonard name. Each of the original firms retained its identity as an operating division and has continued sales under its own brand name.

In addition to the refining facilities, the combined Leonard operation incorporates at 350-mile common-carrier pipeline system including a 260-mile crude line between Toledo and Central Michigan. An 835-mile field gathering system serves the three refineries with Michigan crude. Crude from western Canada is also available when desired through a tie-in with Lakehead Pipe Line Co. at Bay City. In addition, the successor company, through its subsidiaries, operates a marine terminal in Bay City and bulk plants and service stations throughout Central Michigan.

Basis for integration . . . When talks of a merger first began, it was evident that an integration of the companies' properties would bring many mutual advantages. A study undertaken by Refinery Engineering Co., of Tulsa, underscored these benefits.

While none of the three refineries incorporated a balanced complement of modern processing units, together

THE LEONARD REFINERY operates the only catalytic cracking, the T.C.C. shown at the right. Its operation has been improved by addition of new feed-stock sources.

they included all of the facilities required to make a complete line of high-quality products with the sole exception of lubricating oils. Moreover, the interchange of intermediate streams and finished products would greatly improve the flexibility needed to adjust production to output of those products meeting best market demand and price, at any particular time.

This flexibility is particularly important in a market like Central Michigan. Seasonal demand of gasoline, diesel fuel, heating oil, heavy fuel oil, and asphalt varies more widely than in many other sections of the country. The Central Michigan market is largely dependent on local refineries for most of these products, hence the industry must maintain some flexibility of its own, independently of the rest of the country. The refiner with latitude to swing from maximum gasoline and asphalt production in summer, to maximum heating oil and heavy fuel oil in winter can take constant advantage of the market.

Flexibility was only one benefit to be derived from integration. Optimum use of all refining facilities was another. By putting three refineries together, in effect, the successor company could maintain its individual processing units more nearly at capacity, on feed stocks more ideally suited to each operation.

Other pluses on the balance sheet showed promise. No employes were dismissed as a result of the merger and few were relocated. But the new setup will contribute future reductions in overhead. Stabilization of the local market by elimination of spot oversupply will contribute to a more equitable return to the industry as a whole. An outright increase in plant throughput would result, as well as an adjustment to present netbacks.

Table 1 outlines the facilities in the three refineries. This general picture gives evidence of how well they would complement one another.

Leonard operates the only catalytic cracking unit, Mid-West has the only thermal cracking facilities. Roosevelt has the capacity to make a profitable line of specialty naphthas and chemicals. All three plants maintain catalytic reforming. Their total capacity is relatively high; more than 20 per cent of crude capacity vs. less than 14 per cent for the industry as a whole. This will permit stepping up severity to meet growing octane demands, with internal adjustments to give maximum yields. The availability of Leonard's catalytic desulfurization units to the over-all operation permits selection of a wide choice of crude stocks, at favorable price advantages, and improves catalyst life in several units by cleaning up feed stocks.

TABLE 1—COMBINED REFINING FACILITIES
(Capacities in bbl. per stram day)

	Leonard	Mid-West	Roosevelt
Crude distillation	14,000	10,000	7,500
Vacuum distillation	6,000	.....	.....
Tar separation	6.000	.....	.....
Thermal cracking	.....	3,800	.....
Catalytic cracking	7,000	.....	.....
Naph. fractionation	.....	.....	2,000
Catalytic reforming	2,400	2,200	1,800
Cat. desulfurization	.....	.....	3,300
Hydrotreat, reformer feed	2,400	.....	.....
Hydrotreat, distillates	5,200	.....	.....
Platreating	.....	.....	500
Udex	.....	.....	1,200
Polymerization	120	140	.....
Sulfur recovery	11	.....	.....
Asphalt	2,300	.....	.....

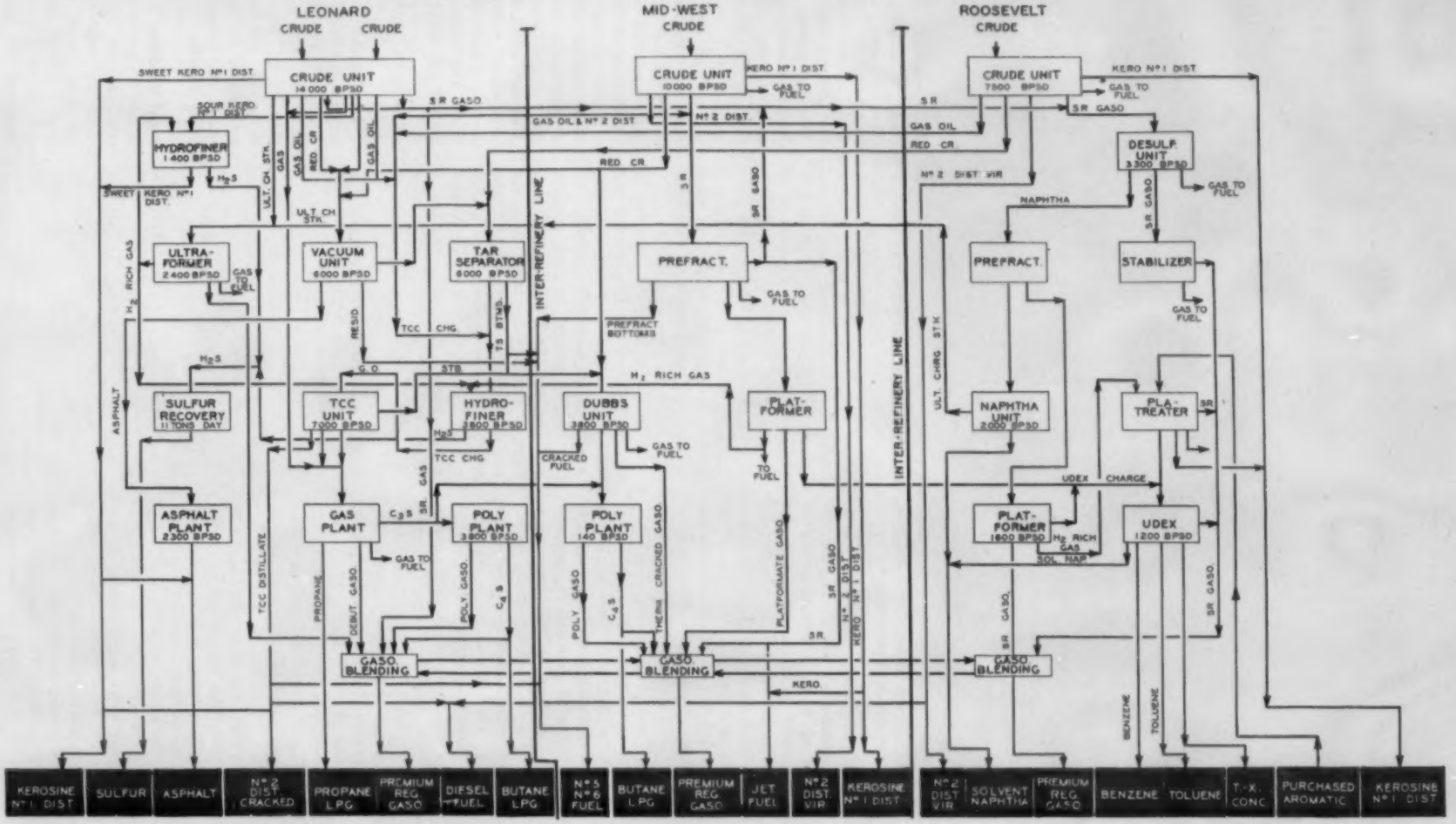
These general points are the key to the success of the integration. The accompanying composite flow chart outlines the details of the operation. This flow chart does not indicate actual stream volumes since no single plan is typical of year-round operation. The interchange of streams among the three plants varies with the types of crude charged to stills and with the market balance on products.

The Leonard and Mid-West plants are located less than a mile apart, and several existing pipelines will handle their stream transfers. For the time being, movements between Roosevelt and the other two refineries will be by tank transport. Eventually, that refinery may also be tied in by pipeline.

Light distillates . . . Wide flexibility is possible in the handling of straight-run gasoline and naphtha streams from the primary crude towers to the three plants. Light gasoline from both Leonard and Mid-West can be split in varying ratios, part going to Roosevelt for specialty uses and the

"Leonard now has a processing system as flexible and modern as any in the nation"

Each of the three individual refineries is a modern installation and was meeting today's problems with a measure of success. But their specific problems were not the same. Each had facilities not shared by the others, and each made different types of specialty products. Integration has resulted in a new high level of economy, flexibility, and product diversification.



remainder being blended directly to motor fuel.

That fraction diverted to Roosevelt is merged with its straightrun naphtha in the catalytic desulfurization unit. From this treated stream a heart cut containing prime solvent and C_6-C_8 Platformer stocks is split in a prefractionator. The remainder is blended to motor fuel at Roosevelt.

The naphtha unit performs a close fractionation for Roosevelt's profitable solvent line.

BTX production at Roosevelt gains by admission of an added stream of close-cut C_6-C_8 platformate from the Mid-West unit. This increment, plus similar streams from Roosevelt's Platformer and Platreater goes to the Udex unit to boost benzene, toluene, and xylene production. Again, solvent naphtha output is augmented by Udex extract.

Tests carried out at Roosevelt have shown Leonard that when higher octanes are necessary, the Udex unit can be operated in conjunction with combined catalytic reforming in a Rexforming pattern. This prospect extends the octane potential of the overall organization well beyond today's requirements.

Integration of the two plants at Alma will serve to bring better hydrogen balance to the desulfurization done at the Leonard refinery. Requirements for pretreating Ultraformer feed stock and desulfurizing kerosine and No. 1 distillate are expected to exceed the hydrogen produced in the Ultraformer. It will be made available from Mid-West's Platformer unit. Roosevelt's hydrogen requirements are in balance, with its Platformer supplying all that is needed in the Platreater operation.

Better balance is also afforded on polymer gasoline. Excess butylene from Leonard's catalytic cracker can be diverted to augment the output from Mid-West's Dubbs unit, when necessary, to maintain the Mid-West poly unit at capacity.

Complete freedom in balancing gallonage, octane, and volatility of motor fuels blended at the three plants, is made possible by interchange of finished stocks. Each plant can draw on the pool of straightrun, polymer, catalytic, reformate, thermal, and butane components in tailoring a well-blended fuel.

Middle distillates . . . The same is true of distillate fuels, including jet fuel, kerosine, No. 1 distillate, diesel fuel, and No. 2 burning oil. These products can be balanced with demand by blending from virgin, catalytic, and thermal stocks from the three refineries.

Residuals . . . The pattern of better balance with market requirements, and optimum returns on product is repeated in the heavy petroleum fractions. This added flexibility is particularly advantageous in adapting runs to marked seasonal variations in asphalt and heavy-fuel demand. It makes full use of the T.C.C. and Dubbs units and permits a better selection of the feed stocks to each of them.

Mid-West's reduced crude can be split as desired between its Dubbs unit and Leonard's vacuum unit. This permits a wider choice of processing, for asphalt manufacture, catalytic cracking, and thermal cracking. T.C.C. charge is further augmented by adding Roosevelt's full reduced crude production to Leonard's tar separator. The bottoms from Leonard's tar separator, after stripping off T.C.C. gas-oil charge, can then be thermally cracked in the Dubbs unit, or blended directly to heavy fuel oil, as the market dictates.

Mid-West's Dubbs unit serves a further purpose in processing heavy cycle stock from the T.C.C. unit. This system gives complete flexibility in processing topped crude from all three refineries. It contrasts sharply with the situation prior to the merger. On independent operation, Leonard could not make full use of its T.C.C. unit. Mid-West was restricted to thermally cracking stocks which would make prime catalytic feed. Roosevelt was completely inflexible, depending on the heavy-fuel market for its reduced crude fraction.

Long-range trends . . . In the long-range program, Roosevelt will revert more and more to the specialty type of operation and eventually will retreat from motor fuels. Roosevelt will be supplied by the other two plants for marketing needs. Further, the special facilities for making solvents and aromatics will be more fully employed by processing the best heartcuts of naphtha from all three refineries.

The Leonard organization has a progressive viewpoint on product diversification. Table 2 illustrates the wide range of products which the contributing companies brought to the merged operation. Others are in prospect. Petrochemicals in particular are slated for long-range attention. The wide variety of processing facilities and the diversity of crudes processed lend the company sufficient latitude to move in a number of directions in this respect. Specialty products other than chemicals are also up for future attention.

The new versatility of the Leonard combine places the company in a favorable position on crude sources. With adequate hydrogen treating, and a full complement of processing facilities the company can select those stocks which will give the best return on its crude-oil dollar without regard to gravity or sulfur content.

Geographically, the company is in a position to select from local sources through its own Central Michigan gathering system.

Canadian crudes are also available from Lakehead Pipe Line via the company's system at Bay City. In addition, Leonard's supply line to Toledo connects with systems moving crude from Texas, Oklahoma, Mississippi, Louisiana, Wyoming, and Montana.

From all aspects, integration of the three plants produces dividends. Leonard now has a processing system as flexible and as modern as any in the nation. **End.**

TABLE 2
LEONARD PRODUCTS

GASOLINE:
- Regular grade
- Premium grade
- Commercial grade
- Marine

DISTILLATES:
- Jet fuel
- Kerosine
- Heater oil
- Furnace oil
- Tractor fuel
- Railroad and marine diesel fuels
- Industrial diesel fuel

L.P.G.:
- Propane
- Butane

RESIDUALS:
- Industrial fuel oil (all grades)

ASPHALTS:
- Paving asphalts
- Asphaltic pipe coating
- Industrial asphalts

SPECIALTIES:
- Cresylic acids
- Aromatic naphthas
- Aliphatic naphthas
- Benzene
- Toluene
- Xylene concentrates
- Ink oils
- Agricultural spray oils
- Sulfur
- Microcrystalline wax pipe coating.

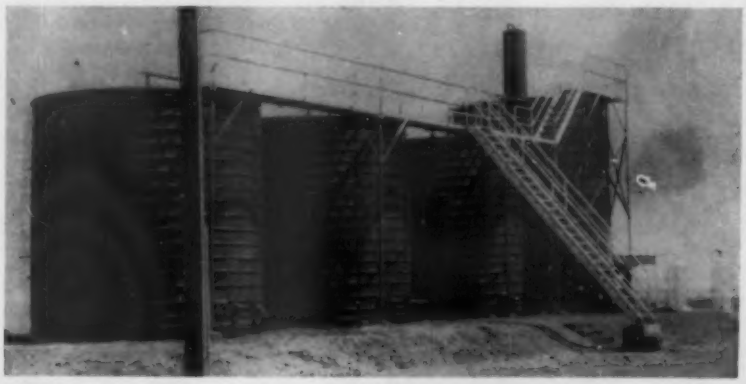
● Here's how Humble has consolidated its old tank batteries and put in automatic controls at Means field. This course proved cheaper than simply expanding old facilities when increasing production forced buying new equipment. The new system is simple and requires little attention or maintenance. It is a good example of what an operator can do . . .

When a Field Outgrows Its Facilities

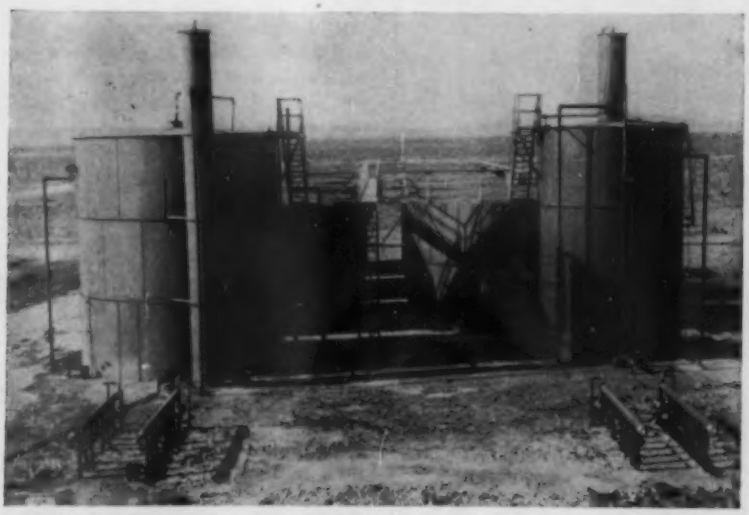
by Ed McGhee
District Editor

UNTIL recently, Humble Oil & Refining Co. ran crude from its 84 wells on the R. M. Means lease of Andrews County, Texas, into seven conventional tank batteries. These batteries handled oil from the Grayburg and San Andres formations in Means field.

When the Queen sand also proved productive in the field, Humble began to drill wells to that formation. At about the same time, increased allowables made it economical to rework some of the old wells in the field. As a result of this new-well drilling and old-well workover, production in the field was soon as high as the old facilities could handle. So, the company had to plan on putting in new equipment.



BEFORE Seven of these wooden-tank batteries collected crude from the lease. Pipeline runs had to be made from the storage at each battery. Fig. 1.



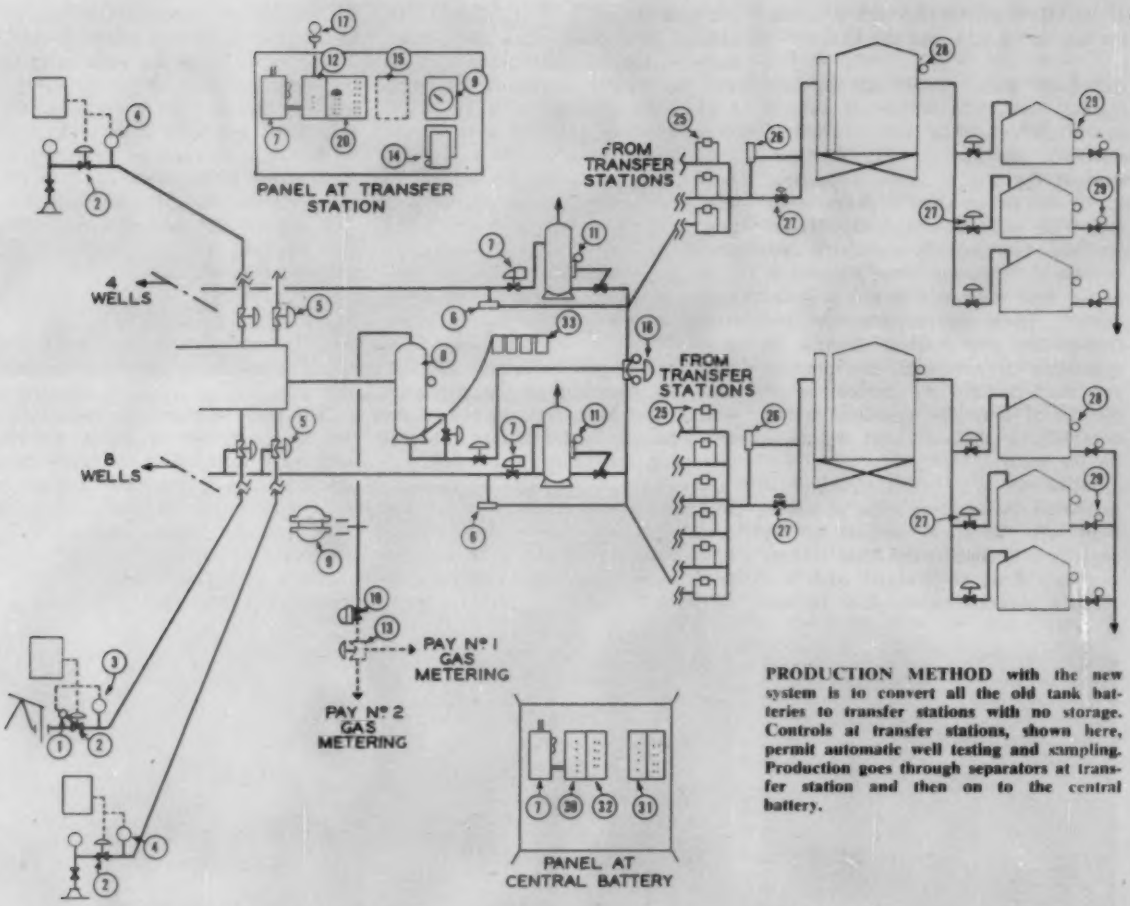
AFTER Single central battery handles all the crude from the lease, cuts pipeline runs 65 per cent. Equipment is in pairs because of two pays. Fig. 2.

It would have been possible to put in more storage at the existing batteries and make more pipeline runs. But Humble decided it would be cheaper and better to convert the old batteries into transfer stations and to install one central battery with automatic controls. In doing this, the company gets the extra oil-handling capacity with the least investment, and the best control of the operations. And the central storage cuts down on pipeline runs by about 65 per cent.

From the wells . . . Old wells on the Means lease such as that in Fig. 3 have beam-type pumping units driven by electric motors. Each of these has been fitted with a shutdown arrangement powered by the same 440-volt a.c. current used to run the pumping-unit motor. If flow-line pressure goes too high (as it might when a valve closes in the flow line at the transfer station), power is cut from the pumping unit motor and a valve is automatically closed on the wellhead.

Humble has already put motor-control boxes at the flowing wells on the lease as shown in Fig. 4. And these wells have the same type of electrically energized shutdown valves on their tubing wings as do the pumping wells. For that reason, there will be no need to change shutdown valves as the wells go on the pump.

From the wells, the oil flows in individual lines to one of the seven



PRODUCTION METHOD with the new system is to convert all the old tank batteries to transfer stations with no storage. Controls at transfer stations, shown here, permit automatic well testing and sampling. Production goes through separators at transfer station and then on to the central battery.

LEGEND

1. Monitoring switch. If valve 2 is closed, this switch prevents the unit pumping against the closed valve.

2. High-pressure shut-in valve. Closes in case of high line pressure caused by closing valve in transfer station or central battery.

3. High-pressure switch. Closes valve 2 and shuts down pumping unit in case of high pressure.

4. High, low-pressure switch. Closes valve 2 on flowing wells.

5. Well-test routing valve. Three-way valve actuated by automatic testing equipment.

6. Relief valve. High-pressure safety relief.

7. Piloted shut-in valve. Safety valve piloted by down-stream pressure.

8. Metering separator. For test.

9. Integrating gas meter. For test.

10. Piloted back-pressure valve. Keeps constant pressure on test separator.

11. High-level shut-in. Actuates valve 7.

12. Master controller. Governs lease shut-in.

13. Test-gas routing valve. Three-way valve routing gas of two pays.

14. Strip chart recorder. Records test information.

15. Metering separator controller.

16. Test-liquid routing valve. Three-way valve routing liquid from two pays.

17. Light alarm showing shutdown.

25. Flow-operated switch monitor. Shows if transfer station is producing.

26. High-pressure relief.

27. Lease shut-in valve. For full storage or malfunction. Also tank fill valve.

28. Level control. High-level Dynatrol.

29. Pipeline valve switch. Prevents opening fill valve when tank is on pipeline run.

30. Master controller. For central battery.

31. Master controller.

32. Tank switcher.

transfer stations. For old wells, these are the same lines that carried the oil to the old batteries.

Into the transfer stations . . . Six of the transfer stations are located in the field at the sites of the old-style tank batteries. One such is shown in Fig. 5. The seventh transfer station is located with the central battery at another old-battery site. The seven stations are roughly the same except that five are especially equipped to handle both Queen-sand oil and the older San Andres - Grayburg production; one other station handles only Queen-sand oil, and the remaining handles only San Andres crude.

Since the San Andres oil is sour and highly corrosive and the Grayburg oil moderately so, production—both oil and gas—is kept separate from the noncorrosive Queen production. Accordingly, transfer stations which handle both crudes have two oil-gas separators, two gas lines, and two trunk lines to carry the oil to the central battery. Trunk lines for San Andres-Grayburg oil are internally coated to prevent corrosion and paraffin deposition. Since the Queen oil is not corrosive and does not deposit paraffin, its lines are not internally coated. But all trunk lines are externally coated and wrapped.

Manifolds at the transfer stations have a steamer header so that each flow line can be steamed to remove paraffin. The same header can be used

to backflow oil to the well location for fracturing jobs and the like.

Automatic tests . . . Besides the two regular production oil-gas separators, each transfer station also has a test separator like that in Fig. 6. Controls at the station make it possible to set up in advance a program to test four wells automatically. There are also four sample chambers that automatically sample fluid from each of the four wells as it is tested in sequence. These sample chambers are transparent and marked so that if separation is complete, the pumper can read directly the percentage of oil and of water. If separation is not complete, a shakeout can be made on the sample.

Fluid out of the test separator is measured by a dump type of meter built into the lower section of the separator. Recording this fluid volume is a strip chart which shows each barrel as it is produced and each 10 barrels (cumulative) as it is produced. In addtion this same chart also shows the well number, the time it goes on test, the time it comes off test, each 1 M.c.f. of gas, and each 10 M.c.f. (cumulative) of gas as it is produced.

By showing the volume of oil and gas as it is produced, the strip chart tells when a well pumps off, when it flows off, and other of its producing characteristics.

As fluid dumps out of the test separator, it joins the regular flow downstream of the production separators. Routing valves switch it into either the Queen production or the San Andres oil, according to the particular well on test. Moreover, the gas off the test separator is routed into either of two lines, according to the well.

In case of trouble . . . If for any reason pressure builds up in trunk lines, such as full storage at the central battery, lease shut-in valves close off flow to the lines. Then, as oil in the production separators builds up to a high level, it trips a float control. This control closes the inlet valve to the separator, backing up the incoming oil through the manifolds, the flow lines, and back to the individual wells. This backed-up pressure, in turn, closes in the wells or shuts off power to the pumping-unit motor.

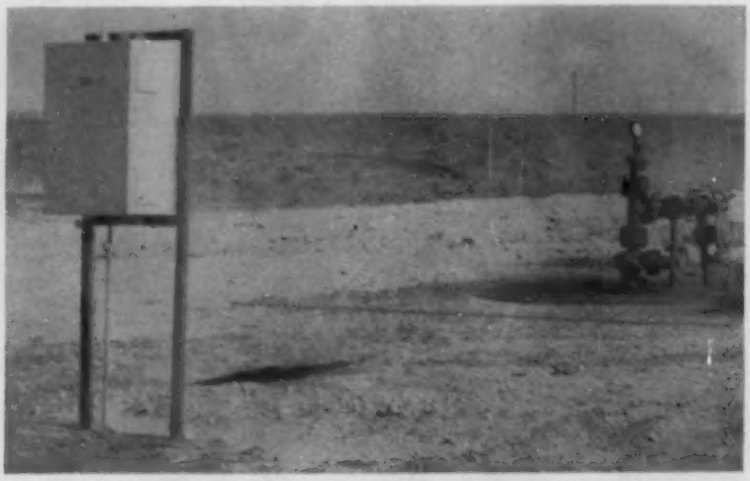
For safety, the headers in the flowline manifold have high-pressure-relief valves which discharge into the trunk lines.

If fluid level builds up in the test, its high-level control will switch the well on test back into regular production.

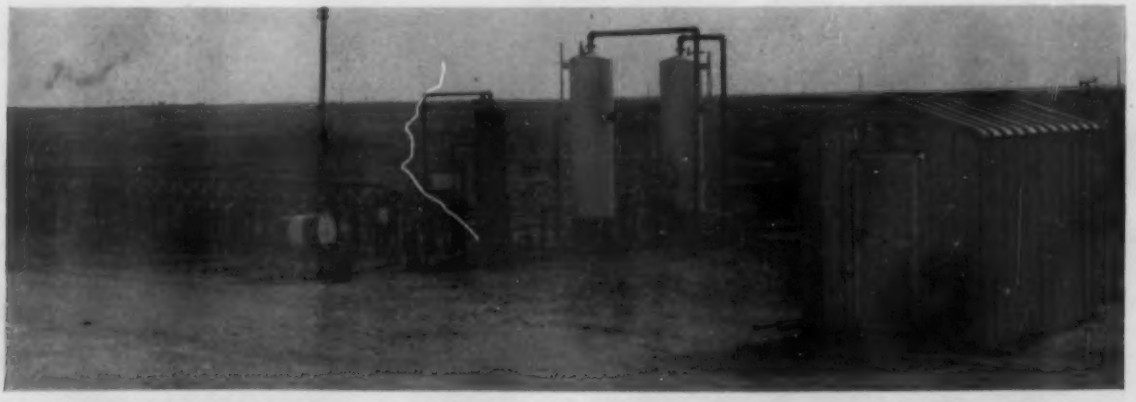
The control panel at each transfer station shows by lights whether each well is on test or in regular production. Also, lights show if there is trouble with the production or test separators that would cause their inlet valves to close.

The control panels also hold the devices for setting up which wells are

PUMPING WELLS have electric motors, will shut down if flow-line pressure goes too high. Fig. 3.



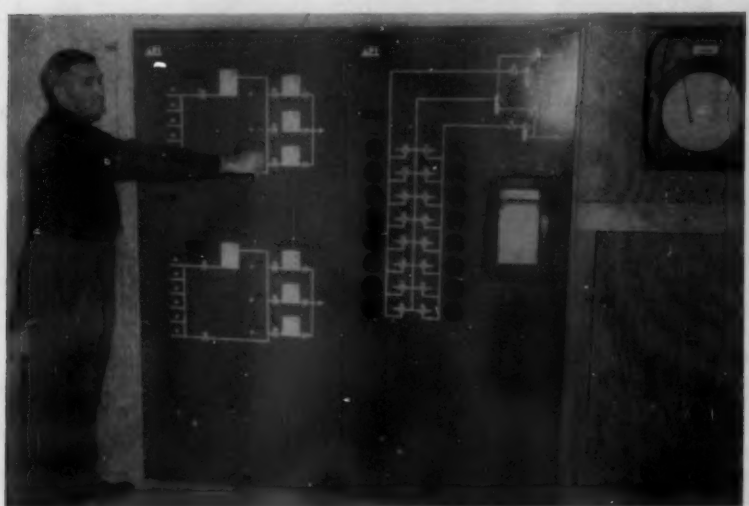
FLOWING WELLS also have the same type of shutdown valves that pumping wells have. There will be no need to change valves when wells no longer flow. Motor-control box is in foreground. Fig. 4.



NEW TRANSFER STATION is on the site of one of the old wooden-tank batteries that delivered directly to pipeline. Station has no tankage, routes oil to the central battery for storage. Fig. 5.

SEPARATORS at transfer station handle production from two zones and test individual wells. Switching valves on well manifold put wells on test. Fig. 6.

CENTRAL STORAGE battery has ground-level gaging and sample cocks at three levels on each tank. Thus, the pumper or gager does not need to climb tank. Fig. 7.



BATTERY CONTROLS are demonstrated here by O. G. Ham, farm boss for Humble. Control panel on right is for the transfer station that adjoins the central battery. Fig. 8.

to go on test and how long each is to be tested.

All automatic valves are electric-pilot-operated pneumatic type. The 110-volt a.c. power is purchased from an outside company which has lines in the field.

To the central battery . . . Keeping the crude separated into two streams continues at the central battery. There is a separate manifold for the Queensand oil and another for the San Andres-Grayburg oil. There is also separate storage; tanks are internally coated with a vinyl material and vent lines are made of aluminum.

Tank switching is automatic. When all storage is full, the automatic switcher shuts the valves coming off the trunk-line header. This closing pressures the trunk lines back to the transfer stations and brings on the well shutdown as already described. For safety, the headers at the central battery have pressure-relief valves that discharge into the gun barrel. Moreover, the gun barrel is arranged so that it will dump all its salt water before it spills out its oil.

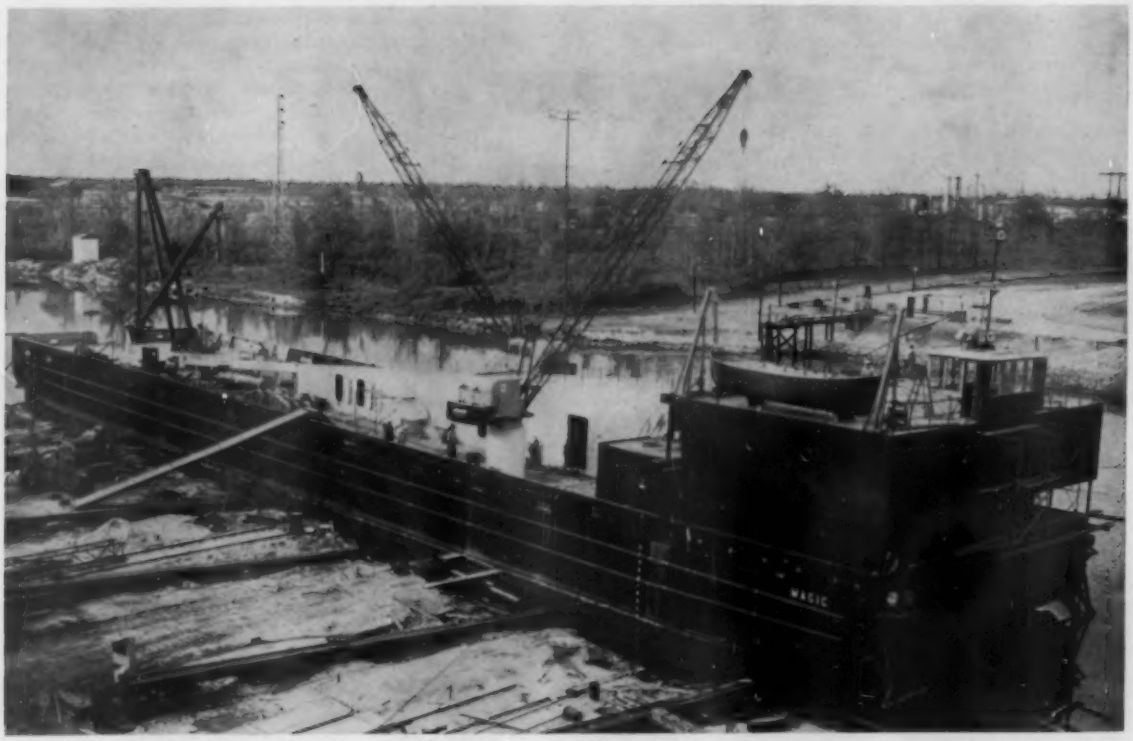
Tanks at the central battery are equipped with ground-level gages as shown in Fig. 7. It is these gages that cause switching when the tank is full. If these gages should fail, there is an emergency high-level-control device in the top of each tank; it will close the tank's fill valve if the gage doesn't. Pipeline valves on the tanks electrically interlock with the fill valves so that no tank on pipeline can receive oil at the same time.

Humble has a house at the central battery that serves as a combination pumper's office, control point for central battery, and control point for the nearby transfer station. See Fig. 8.

Some salvage . . . Because of the corrosive nature of the crude handled by the old batteries, the tanks were made of wood. There were three of these 500-bbl. tanks at each of the seven old batteries. Since there is no wide need for this type of tanks, Humble could not figure on immediately reusing many of them. A small salvage value was put on the tanks, but it was only a small part of the total investment in the new system.

Many of the separators used in the old batteries were used in the new transfer station. Some valves and fittings were also salvaged.

As many as five new wells have been added to the Means lease each month of this year. If the operation of the new production setup lives up to expectations, Humble is considering putting in similar equipment on its other leases in the field. **End.**



A SEAGOING SPREAD is an apt description of this barge, the first ever constructed expressly to lay pipe in offshore waters. Fully equipped, it will weigh close to 1,000 tons.

ITS VERY NAME IS MAGIC

New Sea-Going Pipe-Laying Barge

A NEW era in offshore pipelining was ushered in recently when Marine Gathering Co. commissioned its new pipe-laying barge, the "Magic."

The $750,000, 260-ft. vessel is a completely self-contained unit capable of operating in unprotected gulf waters. It is the first barge expressly constructed to lay pipe in offshore waters, and is essentially a seagoing spread. Fully equipped, it will weigh close to 1,000 tons.

Its most unusual feature is an inclined ramp along which the pipe will travel past the various welding, X-ray, and field-joint stations. An inclined slot at its laying end, meanwhile, makes it possible for the pipe to be held at a constant slope from the time the first stringer bead is welded on to the time it enters the water.

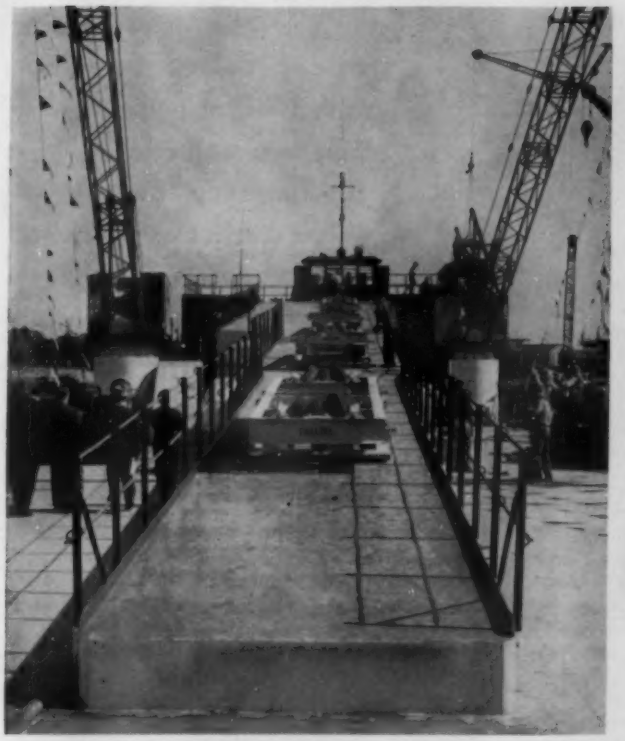
A central generating room provides power for all operating equipment, including welding machines. Two whirlybird cranes and a stiff-leg derrick will handle lifting operations. No crawler tractors are necessary. A special winch arrangement makes it possible for the barge to move along at will—with the help of anchors. These winches are remotely controlled from a pilot house. Complete living quarters for 50 men are included, with a recreational lounge for off-duty crews.

Specifications for the vessel were drawn by Robert C. Ledford, vice president of Marine Gathering, which is a wholly owned subsidiary of Commonwealth Oil Co. headed by President G. Burton Liese. Christensen & Graham, marine architects, Pasadena, Tex., designed the vessel, which was constructed by Marine Fabricating & Engineering Co., near Houston.

Barge layout . . . The Magic has overall dimensions of 260 by 50 ft. with a 13½-ft. hull. A 4-ft. bulwark extends around the deck. Living quarters are located on the forward end of the barge and extend upward two decks, 18 ft. above the main deck. They are surmounted by a small control or pilot house, which extends upward another 8 ft. The superstructure rises 26 ft. above the main deck and 39½ ft. above the bottom of the barge, exclusive of davits, booms, and masts.

The inclined ramp runs lengthwise along the centerline of the barge. It begins at a point 18 ft. back from the front of the barge and above the living quarters. It extends back about 190 ft. where it meets the main deck. The ramp has a slope of 5° along its length. A series of cradles and dollies will support the pipe and provide the roller action for it to move down the ramp. These dollies will extend to the rear of the barge, which is equipped with an inclined slot. This slot is 36 ft. long and 8 ft. wide and permits launching the completed pipe sections directly into the water. The combination of the slot and the ramp makes it possible to conduct all operations without any change in its slope, there-

PIPELINING



CRADLES AND DOLLIES will support pipe as it travels down an inclined ramp into the water. The uniform slope of the ramp eliminates undue strain on the pipe sections.

by Larry Resen
District Editor

Uses Modern Production-Line Principle

by eliminating undue strain on the pipe sections.

The ramp is 18 ft. wide at its forward end above the crews' quarters. This 18-ft. section extends for 32 ft. and then the width drops to 16½ ft. Two successive steps lower to an 8-ft. width along its last 52 ft. This extra width at the forward end makes it possible to conduct many operations at the beginning of the ramp. For instance, when laying small-diameter pipe, the pipe could be double jointed and stacked on the wide section of the ramp and the space above the crews' quarters.

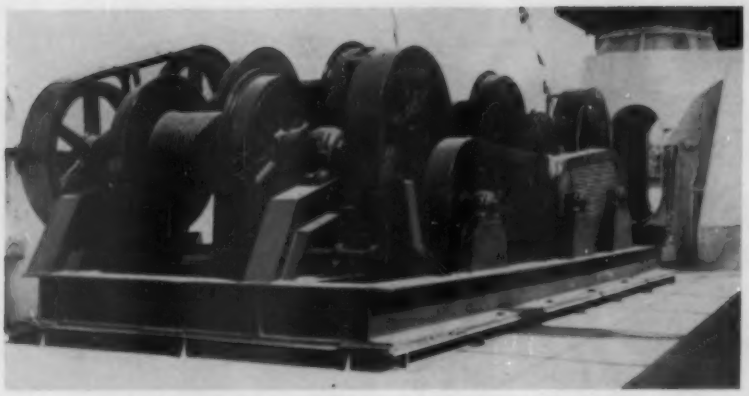
Barge equipment . . . Protected, enclosed spaces are located below the ramp for machinery and equipment. A main machinery room houses two diesel engines direct-connected to two 250-kw. generators. A main switchboard in this space contains three sections, one for each generator and one for shore power connections. Adjacent to this is a motor-control center and a switchboard to serve a 15-kw. auxiliary generator. A welding machine room contains the welding sets required in the spread. An air-conditioned X-ray room and paint locker take up the remainder of the enclosed space below the ramp.

Three cranes will handle pipe and supplies and actual laying operations. Two 25-ton whirlybird cranes are located roughly amidships on either side of the vessel. Each has a 75-ft. boom and will be used for general lifting purposes. Their main job will be to transfer pipe from a supply barge to the top of the ramp. A 35-ton stiff-leg derrick is located at the stern of the barge and has a 65-ft. boom. This will be used in pipe launching.

Below decks is a pump room which houses a 1,000-g.p.m. ballast pump for trimming the vessel. Cooling-water pumps for the engines, bilge pumps, and domestic water-pressure sets are also located here. The barge is designed to operate both inshore and offshore. It will draw as little as 4 ft. of water in shallow areas. Ballast will be admitted to the hull so it will draw 8 ft. in deeper areas. This ballast will add to its stability offshore.

The length of the barge provides working space to set up five spots, or stations. A stringer bead will be applied at the first spot, as a new joint of pipe is lifted off the supply barge and placed on the dollies to butt up against the preceding joint of pipe. Welders will apply hot passes at the second spot, and filler and cap welds will be added at the third spot. X-rays will be taken at the fourth spot and field joints applied at the fifth. These latter joints are simply the addition of concrete over the welds which have been X-rayed and wrapped.

Four-drum winches . . . As each completed joint is ready to leave the barge, the captain will move the barge the length of one joint. The madeup section will enter the water as the pipe travels down the ramp, and space will be provided at the upper end of the



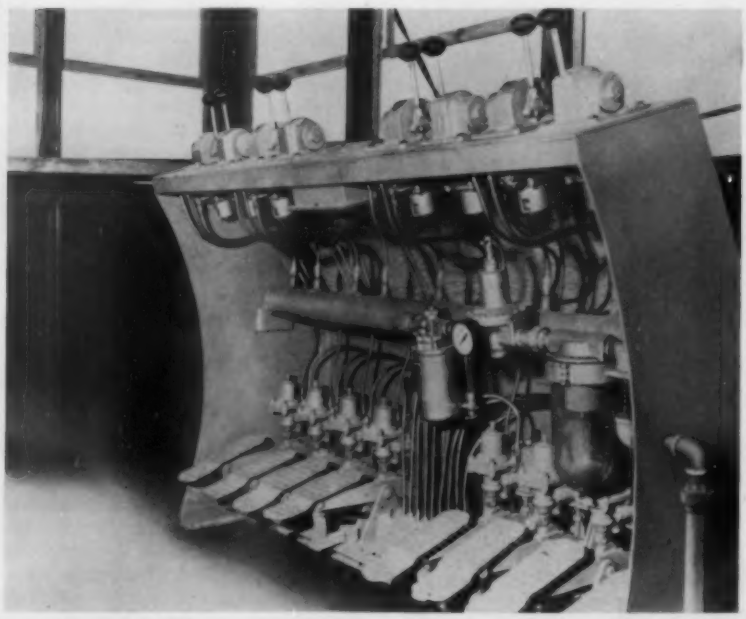
FOUR-DRUM WINCHES of special design are located on both sides of the vessel. These handle cables running to eight anchors.

ramp for the addition of another joint. Thus, the barge will be moved five times from the time a joint is lifted onto the ramp until it enters the water through the inclined slot.

The Magic is equipped with two four-drum winches on each side of the barge on the main deck at a midships location. Each of the drums has a rating of 12,000 lb. at 40 ft. per minute. Each is equipped with 1,200 ft. of 1-in. wire rope. Eight anchors are operated off these winches, each with its individual wire line and each with its individual drum. Two anchors are used at each corner of the barge.

The anchors control barge movement. By means of the winches, the wire lines are taken up on the forward anchors and released on the rear anchors. This is how the barge moves forward. Theoretically, in moving the barge, all four rear anchors would be lowered with a minimum of wire line let out. The forward anchors would be positioned as far forward as possible. The barge would then move forward until all of the rear line had been let out and all of the forward lines pulled in. The hitch here is that operations would have to be halted until all anchors were repositioned. The use of eight anchors and continuous repositioning makes it possible to operate without any delays due to barge movements.

A tug will be in attendance at all times. Its job will be to pick up an anchor and move it to the correct position, then move to another anchor and position it. The anchors will be staggered with respect to the barge.



REMOTE CONTROLLERS will enable the captain to control movements of barge by repositioning anchors. Controllers operate winches which reel in and let out anchor cables.

"The Magic is designed to operate round-the-clock, with two complete shifts of pipeline workers. A pipe superintendent and his assistant will head up the over-all operation. A chef and two galley stewards will complete the total complement of 46 men."

The tug will be picking up the ones nearest the forward end of the barge and moving them as far forward as possible and picking up the rear ones farthest from the barge and moving them closer. In this manner, the barge will always have enough slack both forward and aft to move as desired. The use of eight anchors means the barge will always be secured at every corner since only one anchor will be moved at a time.

The winches are controlled through air-operated remote-control mechanisms located in the control house. The barge captain will be in radio communication with the tug and operate the individual drums as required when the tug is repositioning an anchor according to the leapfrog tactics. The captain will also operate all of the drums, taking up on the forward ones and releasing on the rear ones to move the barge forward a joint at a time.

The Magic is designed to operate round-the-clock, with two complete shifts of pipeline workers. These include a ramp foreman, six welders, a crane operator, two swampers, and an X-ray technician. The barge crew includes a captain, first mate, and five able-bodied seamen. A pipe superintendent and his assistant will head up the over-all operation. A chef and two galley stewards will complete the total complement of 46 men.

The barge was designed and constructed to American Bureau of Shipping standards and has received U. S. Coast Guard approval. The hull is constructed with watertight compartments to increase its seaworthiness. It is also equipped with a fully outfitted seagoing lifeboat.

Commonwealth-Marine executives, in addition to Licse and Ledford, include L. E. Davis, superintendent of construction and operations; M. I. McGowan, chief engineer; and Albert Cohen, pipe superintendent. **End.**

An engineering approach to the problem of determining

Saturation and Porosity From Electric Logs in Shaly Sands

Part 2

(Part 1 appeared March 4, 1957.)

by A. J. de Witte

THE first part of this article dealt with the resistivity relations in clean and shaly sands and gave an historical account of the advances made in the interpretation of formation resistivities. This second part will sketch the parallel developments concerning the self-potential in clean and shaly formations. The results obtained are then combined into a practical method for computing saturation and porosity from electric logs.

3. The S.P. in Water-Bearing Sands

The spontaneous potentials encountered in drill holes were recognized by the Schlumberger brothers and Leonardson[13] to be mainly of an electrochemical nature. They reasoned that the formation boundaries in a borehole would be the site of electromotive forces comparable to those of a galvanic cell and arising from potential differences at each of the contacts: mud (fresh water)—salt water; salt water—clay and clay-mud (fresh water). These potential differences are indicated as V_1, V_2, and V_3, respectively, in Fig. 5a. The sand as such, according to them, had no influence but only served as a receptacle in which the two fluids came into contact. For the electromotive force V_1 of this liquid junction, they gave the formula:*

$$V_1 = E_1 = \frac{RT}{zF}\,\frac{v-u}{u-v}\,\ln\frac{c_1}{c_2} \qquad (11)$$

where:

E_1 = electromotive force in volts
T = absolute temperature
z = valency of dissolved ions
R = gas constant for one mole of perfect gases (8.315 joule/deg. abs.)
F = the Faraday constant (96,500 coulombs)
u and v = the mobilities of cation and anion
ln = Naparian logarithm
c_1 and c_2 = the concentrations of the two solutions, concentrated and dilute, respectively

Applying the formula to solutions of NaCl for which $z = 1$, $u/(u+v) = 0.4$, $v/(u+v) = 0.6$ and inserting the values for the constants, they obtained (in millivolts) $V_1 = E = 11.6 \log c_1/c_2$ for the e.m.f. of contact at 25° C.

The e.m.f. of a voltaic element both in polarization and concentration cells is proportional to the logarithm of the concentration ratio of the electrolytes in such cells. They concluded, therefore, that the total spontaneous potential in a borehole could also be expressed in the form:

$$E = K \log c_w/c_m \qquad (12)$$

c_w and c_m being the concentrations of connate water and mud. According to theory, the ratio of the activities appears under the log sign. Activities, however, are among the hardest things to understand. Since they are roughly proportional to concentrations, the concentration ratio is used; or since the concentrations of electrolytes are about inversely proportional to resistivities:

$$E = K \log R_m/R_w = S.P. \qquad (13)$$

where K is a proportionality constant as yet unspecified.

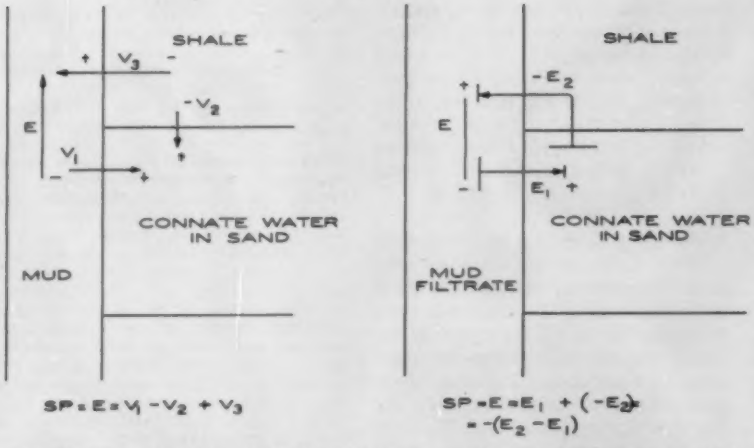
Wyllie,[14] several years later, circumscribed the value of K. He considered the electromotive forces, giving rise to the self-potential in a borehole, to be composed of two e.m.f.'s very much as conceived by the Schlumbergers and as subsequently further suggested by experiments of Mounce and Rust;[15] namely, the potential across a shale barrier separating two solutions of different concentrations and the potential at the liquid junction of the two solutions (already calculated by Schlumberger). Schematically this is shown in Fig. 5b.

Wyllie computed these two components, taking the shale to act as a perfect membrane (permeable only to positive ions) and the sand again to be an inert porous plug (clean sand!) affording contact between the two solutions (in this case, mud filtrate and connate water). Both components are proportional to the absolute tempera-

*Nernst formula (1888).

Author is with Gulf Research & Development Co., Harmarville, Pa.

PRODUCING



ORIGIN OF S. P. first was conceived to be made up of potential differences as at left, above. A later conception is that at right where shale acts as a membrane. Fig. 5a and 5b.

ture. The sum of the two components at 77° F. turns out to be:*

$$E_{sp} = 70 \log R_{mf}/R_w \quad (13a)$$

for the S.P. in a clean sand (S.P.$_c$).

Value of K . . . Recent experiments[8] show that the assumption of common shales acting like perfect membranes is not, in general, fully justified. If it is not, the factor K in Equation 13 would reduce to a value < 70. The remarkable constancy of the shale base line over large sand-shale sections on many logs, however, implies that either the shales in those sections are perfect membranes or that they are all imperfect to the same degree. Since the latter possibility seems rather remote, one has to conclude that apparently the majority of shales in situ act as perfect membranes.

On the other hand, the value of $K = 70$ was calculated on the basis of both electrolytes being NaCl solutions. There is evidence that in case other salts are important constituents of the solutions, e.g., carbonates and sulfates of magnesium and calcium in some of the fresher subsurface waters, Equation 13a no longer holds. A good formula for self-potentials in those circumstances, so-called anomalous S.P.'s, is still the subject of much experimentation, theory, and conjecture. In a recent publication† the relation:

$$S.P. = 70 \log \frac{a_{Na}' + (a_{Ca}' + a_{Mg}')^{1/2}}{a_{Na}'' + (a_{Ca}'' + a_{Mg}'')^{1/2}}$$

was proposed, the a's being activities of the various ions as indicated by subscripts; prime values pertaining to formation water and double-primed values to mud. It is reported to have been successfully applied in practice. The combination anomalous S.P. plus shaly sand fairly well defies analysis at the present time. Fortunately, this unfavorable conjunction is rare.

Shaly sand S.P. . . . Log experience has shown abundantly that the S.P. in shaly water sands is less than in clean sands carrying the same water. Shaly parts of the same formation have lower S.P. than clean parts. If a sand, as the geologists say, shales out, the S.P. disappears completely.

Supposing now that Equation 13 still could be used in the case of a shaly sand, the value of K would have to be lower than for clean sands. The clean-sand formula (13a) then, if applied to the S.P. of a shaly sand (S.P.$_{so}$) in order to calculate R_w, would therefore result in too high a value of R_w (as long as $R_{mf} > R_w$, which is normally the case). This is usually expressed by:

$$S.P._{so} = 70 \log R_{mf}/R_{wa} \quad (13b)$$

where R_{wa} is an "apparent water resistivity" $> R_w$.

It will be remembered from Equation 5 that $F_{a1} \times R_w = R_o$. From Equation 5a we see that $F_{a2} < F_{a1}$ when $R_{mf} > R_w$, so that we have $F_{a2} \times R_w < F_{a1} \times R_w = R_o < F_{a1} \times R_{wa}$. If we determine the "apparent formation factor" F_{a2} from the resistivity of the invaded zone R_{i_0} and the "apparent water resistivity" from the S.P. in a shaly sand by Equation 13b, it might be that:

$$F_{a2} \times R_{wa} \sim R_o \quad (14)$$

In words, if R_o is written as the product of two factors of which one is too small (F_{a2}) and the other is too big (R_{wa}), chances are that the answer might be just right. The two errors have a tendency to balance, although it would be rather fortunate if they canceled exactly. If it were so; that is, if we accept the equality (14), then we should have:

$$S.P._{so} = 70 \log R_{mf}/R_{wa}$$

$$= 70 \log \frac{R_{mf} \times F_{a2}}{R_{wa} \times F_{a2}}$$

or

$$S.P._{so} = 70 \log R_{i_0}/R_o \quad (15)$$

as the expression for the S.P. in a shaly water sand. This expression or its equivalent (14) is known as the Tixier relation. Admittedly, the argument used to derive Equation 15 is weak. (However, it is along the same line of reasoning that Tixier originally arrived at this relation.) It is hardly more convincing to observe the analogy which exists with the S.P. in a clean sand for which by Equation 13a also:

$$S.P._c = 70 \log R_{mf}/R_w$$

$$= 70 \log \frac{F \times R_{mf}}{F \times R_w} = 70 \log R_{i_0}/R_o$$

The case for Equation 15 has been made in several theoretical studies[16 17 18]. By marshaling a considerable amount of rather abstruse electrochemistry, whereby the shaly sand is treated as an imperfect membrane,* with an inherent liberal number of assumptions regarding mobilities and activities of ions within the membrane, it has been demonstrated that the relation should approximately obtain.

Poupon, Loy, and Tixier[19] claimed that Equation 15 could be derived from an earlier equation by Doll, who represented a shaly sand as a fine interlamination of shale and clean sand. They did not, however, give this derivation.

What data show . . . To decide the issue, let us examine the experimental evidence at hand. Firstly, the paper by Poupon et al.[19] contains a graph of S.P.$_{so}$ versus R_{i_0}/R_o (as determined from logs) for about 60 shaly water sands. The points are fairly well confined between the lines $S.P._{so} = 60 \log R_{i_0}/R_o$ and $S.P._{so} = 80 \log R_{i_0}/R_o$. Secondly, Wyllie and Southwick[20] presented a similar plot of laboratory measurements on natural shaly sand cores as well as on artificial shaly sands (aggregates of glass beads with pellets of ion-exchange resin). They found Equation 15 to hold within the limits $56 < K < 80$. Leaving out the beads, they found K to vary between 65 and 80 for the natural sands.

It appears then from all indications that, everything considered, one is about equally well justified in writing for the S.P. in a shaly sand:

$$S.P._{so} \sim K_c \log R_{i_0}/R_o$$

as in expressing the S.P. for a clean sand by:

*The expression for the e.m.f. across a membrane transmitting only positive ions (perfect cation-exchange membrane) can be obtained by setting the mobility of the anion $v = 0$ in the foregoing equation, $E = (RT/zF)\,[v-u)/(v+u)]\,\ln c_1/c_2$, which then reduces simply to $E_2 = (RT/zF) \ln c_1/c_2$ or $E_2 = -59 \log c_1/c_2$. The minus sign indicates that the polarity of the solutions is now reversed (with respect to E_1). See Fig. 5b. The potential E_2 across such a membrane is identical to the polarization e.m.f. between two solutions of different concentration which are connected by a bridge of the cation metal. (The experiment can be done, for instance, using calomel electrodes for the measurement, with a copper wire linking $CuCl_2$ solutions or with Na/Hg between NaCl but not with sodium because of its violent reaction with water). The total e.m.f. in the chain of Fig. 5b evidently is $E_{sp} = E_1 + (-E_2) = -(E_2 - E_1) = 70 \log c_1/c_2$.

†"An Experimental Study on the Influence of the Chemical Composition of Electrolytes on the S.P. Curve" by M. Gondouin, M. P. Tixier, and G. L. Simard, A.I.M.E. paper, spring meeting, Casper, Wyo., May 1956.

*The equations for the potential across an imperfect membrane between two electrolytes are taken from the membrane theories of Meyer and Sievers, Helv. Chim. Acta 19, 649 (1935); Teorell, Proc. Soc. Exptl. Biol. Med. 33, 282 (1935) (Ref. 16); or Scratchard, J. Amer. Chem. Soc. 75, 2883 (1953) (Ref. 18). These equations are then applied to a shaly sand as a membrane "separating" mud filtrate and connate water. Although there is certainly much similarity, the identity of the two processes is not quite clear. In particular, the Meyer-Sievers-Teorell equations were derived for a single-phase membrane in which there are no distinct regions of pores and solid. A shaly sand does not constitute such a medium.

$$S.P._c = K_c \log R_{mf}/R_w$$

K_c in both cases varying from 60 to 80 and usually taken as 70 at 77° F. As said before, K_c is proportional to absolute temperature. If, therefore, $K_c = 70$ is given at 77° F., K_c at any other temperature t °F. is:

$$K_{ct} = \frac{70}{298}[5/9\ (t - 32) + 273)] \quad (16)$$

Effect of shaliness . . . Let us see what are the implications of Equation 15. Combinations of Equations 3, 3a, and 13a gives:

$$S.P._{so} = K_c \log R_{lo}/R_o$$

$$= K_c \log \frac{A + (B/R_w)}{A + (B/R_{mf})}$$

$$= K_c \log \frac{R_{mf}}{R_w} \times \frac{(A/B)\,R_w + 1}{(A/B)\,R_{mf} + 1}$$

$$= S.P._c + K_c \log \frac{(A/B)\,R_w + 1}{(A/B)\,R_{mf} + 1} \quad *(17)$$

(log term negative when $R_w < R_{mf}$)

It follows directly from Equation 17 that:

1. $S.P._{so}$ always $< S.P._c$ or that, all other things being equal, the S.P. is less in a shaly sand than in a clean sand.

2. If $A \to 0$ then $S.P._{so} \to S.P._c$ or, as the sand becomes less shaly, the S.P. approaches that of a clean sand.

3. If $B \to 0$, $S.P._{so} \to 0$, or, if the sand gets very, very shaly, the S.P. vanishes altogether.

4. For a fixed ratio R_{mf}/R_w, if $R_{mf} \to \infty$, $S.P._{so} \to 0$.

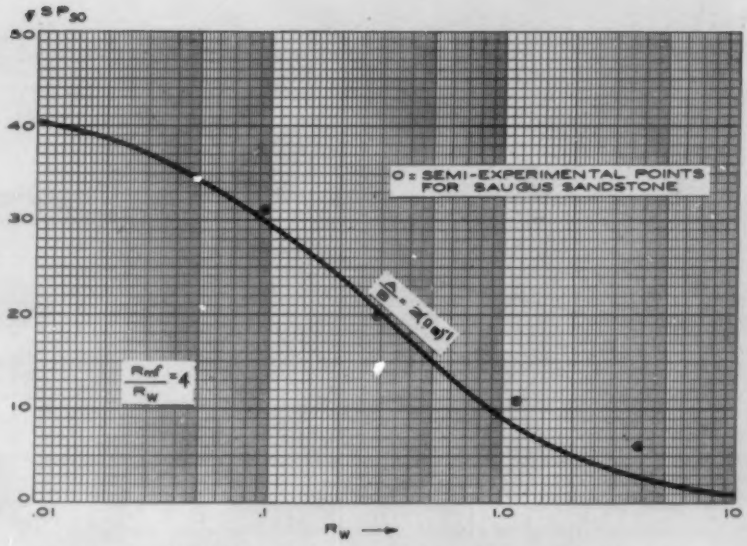
5. For a fixed ratio R_{mf}/R_w, if $R_{mf} \to 0$, $S.P._{so} \to S.P._c$.

*It may be of interest to note that an equation similar to (17) has been derived for "synthetic dirty sands" consisting of beds of granular ion-exchange resin (Ref. 30). An equivalent model representation is assumed for such a porous ion-exchange plug and, from physical considerations relative to this equivalent, the resistivity of the plug saturated with an electrolyte and the potential across the plug between two electrolytes of different concentration are calculated. The resulting equation for the S.P. of a shaly water sand, or at least its synthetic analog, transposed into our nomenclature reads:

$$S.P._{so} = K_c \frac{1}{(A\,R_w'/B) + 1} \log \frac{R_{mf}}{R_w}$$

where $R_w' = 1/2\ (R_w + R_{mf})$.

The variation of $S.P._{so}$ with R_w and R_{mf} is very much the same as that predicted by Equation 17. It would be perfectly feasible to base further developments on this slightly different relation instead of (17), but the final answers would not be materially altered. As it is, the similarity of results with (17) would also tend to support the approximate validity of Equation 15.



SHALY SAND acts more like a shale as resistivities of connate water and mud filtrate increase. At high resistivities S.P. approaches zero. Fig. 6.

Conclusions 1 to 3 are evidently in accord with experience. Conclusions 4 and 5 could be stated as follows: For a given contrast in the resistivities R_{mf} and R_w, a shaly sand, as far as the S.P. is concerned, acts more like a shale when these resistivities are high (fresh mud and water) and more like a clean sand when the resistivities are low (saline mud and water).

The truth of this statement is fully confirmed by laboratory measurements of potentials across shaly sand cores between solutions of different resistivity.* This may be seen from Fig. 6 where the S.P. of a shaly Saugus sandstone (Lower Pleistocene, southern California) for a constant solution resistivity ratio R_{mf}/R_w equals 4 has been plotted against the resistivity R_w of the most concentrated solution. From conductivity measurements (Fig. 7), the shaliness A/B of this Saugus core had been found to be $A/B = 2\ (\text{ohm-m.})^{-1}$. Unlike in clean sands, the S.P. not only depends on the ratio of the concentrations but also on their absolute magnitude.

A graph of Equation 17 for $A/B = 2\ (\text{ohm-m.})^{-1}$ and $R_{mf}/R_w = 4$ is also shown on Fig. 6. The agreement with the experimental plot is striking. Many similar experimental plots have been published (Wyllie,[20] MacCardell,[16] and de Witte[15]). They all exhibit the same trend. Equation 17 contains all the features required by practice and accounts very well, at least qualitatively, for experimental observations. This agreement is probably the best indirect evidence for the approximate validity of Equations 14 or 15, although they scarcely could have been found this way.

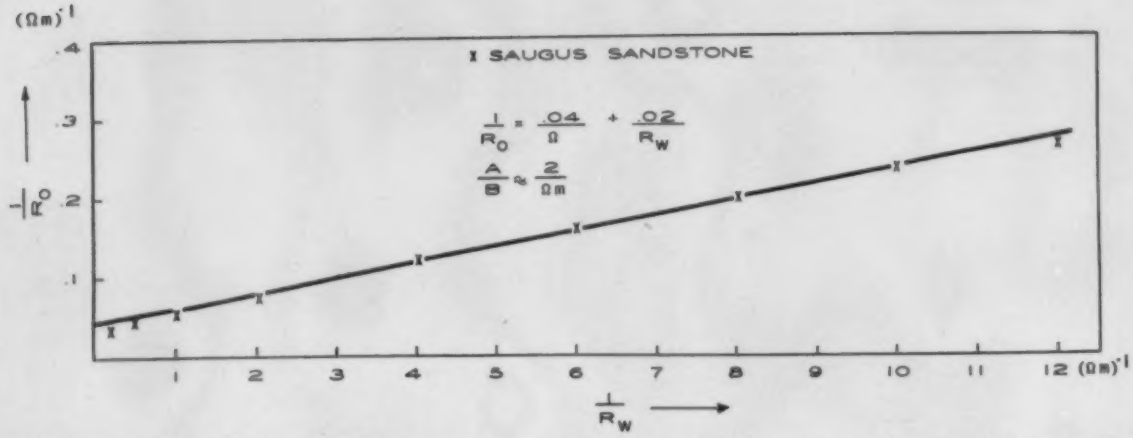
*To get the corresponding S.P., these potentials are subtracted from the ideal shale (perfect membrane) potential according to the scheme shown in Fig. 5b. The plotted S.P. in Fig. 6 is therefore only semi-experimental.

4. S.P. in Oil-Bearing Sands

There is no good reason why the S.P. in clean sand should vary with oil content. Nothing in the principles of derivation of Equation 13a suggests that oil affects the S.P. since the clean sand is only an inert medium providing contact between the two solutions of different concentrations. Field observations, although perfectly clean sands are, of course, rarely encountered, do not indicate that the S.P. log of oil-bearing clean sands is any different from the S.P. logged in water-bearing clean sands. It may therefore be taken for granted that the S.P. in clean porous rocks, whether oil-bearing or not, is still given by Equation 13a.

$$S.P._c = 70 \log R_{mf}/R_w \text{ (at 77° F.)}$$

On the contrary in shaly sands, field evidence tends to show that the S.P. when oil is present is cut back as compared with the S.P. in water-bearing sections of the same shaly reservoir. It must be conceded, however, that pertinent clear-cut observations are hard to come by because lithology changes even within a given reservoir never can be quite discounted. On the other hand, laboratory experiments on cores of shaly sands, which one may think to be the



CONDUCTIVITY MEASUREMENTS on Saugus sandstone show a shaliness (A/B) of 2 (ohm-m.)$^{-1}$. Fig. 6 shows plot of S.P. equation for this value. Fig. 7.

obvious means of settling the question, are beset by great difficulty as soon as oil is introduced. What little evidence is available, on the whole, points in the direction of a **decrease of the S.P. by oil in shaly sands.**

This result is not altogether unexpected.

$$S.P._{oo} = K_c \log \frac{R_{mf}}{R_w} \frac{[(A/B) \times R_w + 1]}{[(A/B) \times R_{mf} + 1]} \quad (17)$$

shows that the S.P. in a shaly sand is dependent on the shaliness A/B. However, it was noted in Part 1 that the shaliness in an oil-bearing shaly sand is effectively increased to $A/(B\,S_w)$. It is not then illogical to write by analogy to Equation 17 for the S.P. in an oil-bearing shaly sand:

$$S.P._o = K_c \log \frac{R_{mf}}{R_w} \frac{[(A/B\,S_w) \times R_w + 1]}{[(A/B\,S_w) \times R_{mf} + 1]} \quad (18)$$

with K_c at any temperature given by Equation 16. Since $S_w \leq 1$ it is apparent that this equation would account for the suspected dimunition of the S.P. through the presence of oil.*

Nomographs to Find Water Saturation and Porosity

The first question in electric-log interpretation, whether a sand is oil-bearing or not, can be resolved by computing the water saturation. All reservoirs with a water saturation exceeding a certain limit, say 60 per cent (less than 40 per cent oil saturation), may then be discarded as nonoil productive.

The next important item is the porosity of the reservoir rock. Together, saturation and porosity determine the quantity of oil in place per acre-foot of reservoir.

There are other factors which bear upon the final classification of a sand as either commercially productive or nonproductive, foremost among them is permeability. But, at present, it cannot be determined from electric logs and it is doubtful that it ever will be.†

We are concerned here with the answers to the first two problems. From the foregoing we have the following equations in hand:

1. Saturation

$$\frac{1}{R_t} = A\,S_w + \frac{B\,S_w^2}{R_w} \quad (9)$$

for the true formation resistivity and, similarly:

$$\frac{1}{R_i} = A\,S_{wi} + \frac{B\,S_{wi}^2}{R_{mf}} \quad (9a)$$

for the resistivity of the invaded zone when S_{wi} equals water saturation in the invaded zone or $S_{wi} = (1 - ROS)$ where ROS equals the residual hydrocarbon saturation of the invaded zone. (By setting S_w and S_{wi} equal to 1 in Equations 9 and 9a, respectively, we have the Equations 2 and 2a for $1/R_o$ and $1/R_{io}$ pertaining to 100 per cent water-saturated sands.) Furthermore, for the S.P.:

$$S.P._o = K_c \log \frac{R_{mf}}{R_w} \frac{[(A/B\,S_w) \times R_w + 1]}{[(A/B\,S_w) \times R_{mf} + 1]} \quad (18)$$

with

$$K_c = (K_c)_{77}/298\,[5/9\,(t-32) + 273]$$

at t °F., which again reduces to Equation 15 for $S.P._{oo}$ of a water sand when $S_w = 1$.

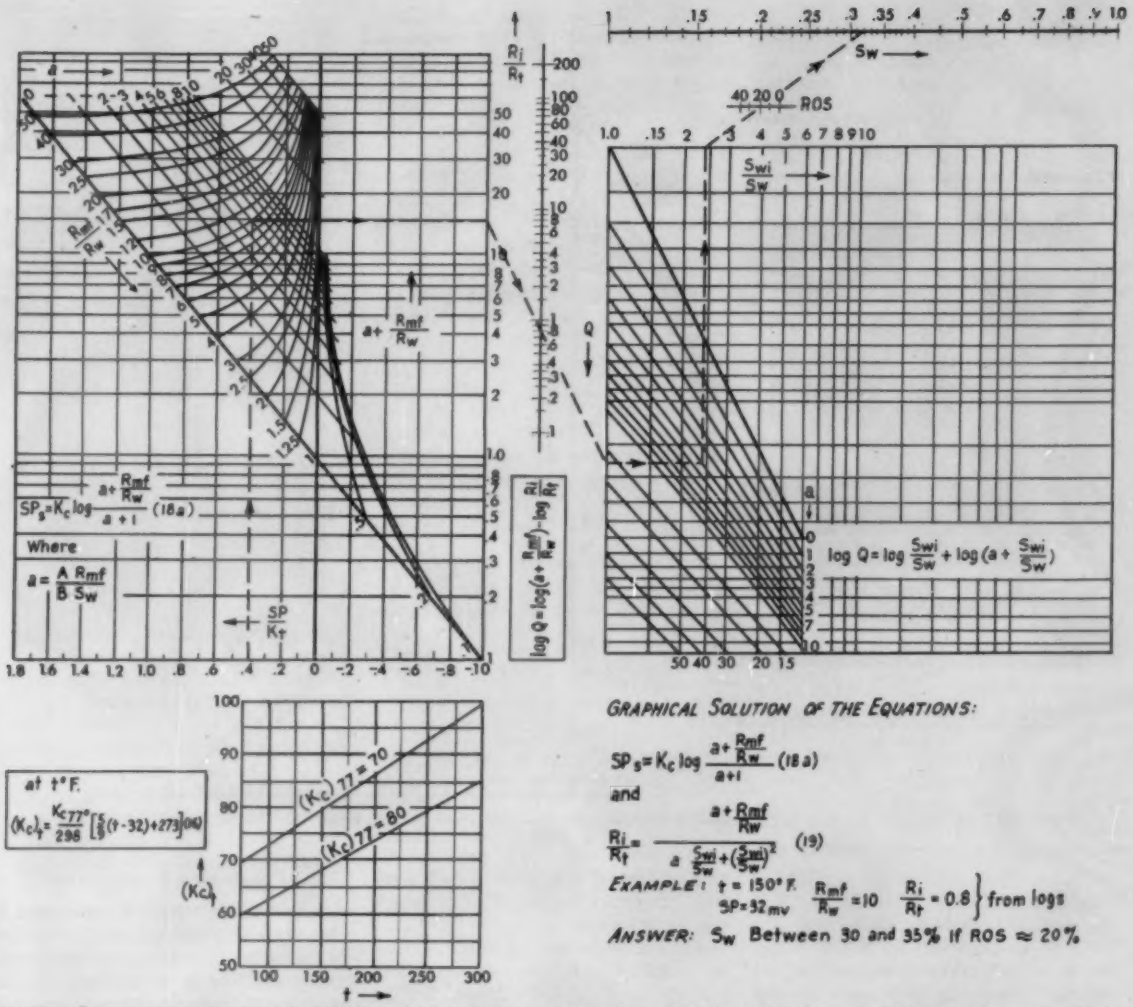
The quantities R_t, R_i and $S.P._o$ (or R_o, R_{io} and $S.P._{oo}$ as the case may be) are obtained from suitable logs as follows:

1. R_t (or R_o) in thick beds (20 ft. and up) from departure-curve analysis[22] of recordings with conventional normal or lateral electrode arrangements; in thin beds from focused-type logs, notably the Laterolog or guard log,[23,24] when highly conductive drilling fluids are used; and the induction log,[25] particularly suited for fresh or nonconductive drilling muds but also applicable in the more conductive ones.

2. R_i (or R_{io}), as above, from departure-curve analysis of conventional logs or, and necessarily so in thin beds, from recordings with short-spaced electrode devices such as short

*It cannot be dissimulated that the reasoning here is somewhat glib and that a certain ambiguity is rather arbitrarily resolved. Why not, for instance, write $S.P._o = K_c \log (R_i/R_t)$ by analogy to Equation 15 where R_i and R_t are the resistivities of the invaded zone and the uninvaded portion of the oil sand? This is not done because it would not generally result in the desired decrease of the S.P. with oil content; besides it does not even hold true for clean sands, but there are other possible alternatives.

†I hope to implement this statement in a forthcoming article.



GRAPHICAL SOLUTION OF THE EQUATIONS:

$$SP_s = K_c \log \frac{a + \frac{R_{mf}}{R_w}}{a+1} \quad (18a)$$

and

$$\frac{R_i}{R_t} = \frac{a + \frac{R_{mf}}{R_w}}{a\,\frac{S_{wi}}{S_w} + \left(\frac{S_{wi}}{S_w}\right)^2} \quad (19)$$

EXAMPLE: $t = 150°F$. $SP = 32$ mv; $\frac{R_{mf}}{R_w} = 10$; $\frac{R_i}{R_t} = 0.8$ } from logs

ANSWER: S_w Between 30 and 35% if ROS ≈ 20%

WATER SATURATION OF SHALY SANDS is determined by S.P., R_i and R_t taken from electric logs and R_{mf} and R_w measurements. Fig. 8.

normal, limestone lateral sonde[26] and especially from so-called contact devices with very short electrode spacings: MicroLog,[27,9] contact log, and Microlaterolog.[28]

3. $S.P._s$ from the regular S.P. log [directly without any correction in most cases and with a correction in thin beds[29] (less than 15 ft. thick)].

Furthermore, it must be provided that R_{mf} and R_w are known. R_{mf} is measured on a sample of mud filtrate. R_w must be available from measurement on samples of formation water in the area or, in the absence of this information, can be computed from Equation 13a if a clean water sand is **known** to exist in the same stratigraphic unit as the section being analyzed.

All these directly or indirectly measurable quantities in the above Equations 9, 9a, and 18 thus having been determined, the three equations relate four unknowns, A, B, S_w, and S_{wi}. Obviously, all four cannot be determined from three equations. This means that we have to **guess** one in order to solve the others. The only one that can reasonably be guessed at is S_{wi}. It amounts to estimating the residual oil ROS = $(1 - S_{wi})$.

If the sand is oil bearing **at all,** it is safe to say that there will be from 10 to 30 per cent residual oil left in the invaded zone. The choice of any particular ROS will vary depending on local knowledge of the formation under investigation.

Graphical solution . . . The equations can now be solved for S_w. This is most easily done graphically. A chart for graphical solution of the equations is presented in Fig. 8. This S_w nomograph was constructed as follows (from Equation 18):

$$S.P._s = K_c \log \frac{(A\,R_{mf}/B\,S_w) + R_{mf}/R_w}{(A\,R_{mf}/B\,S_w) + 1} \quad (18a)$$

Let:

$$(A\,R_{mf}/B\,S_w) = a \text{ and}$$

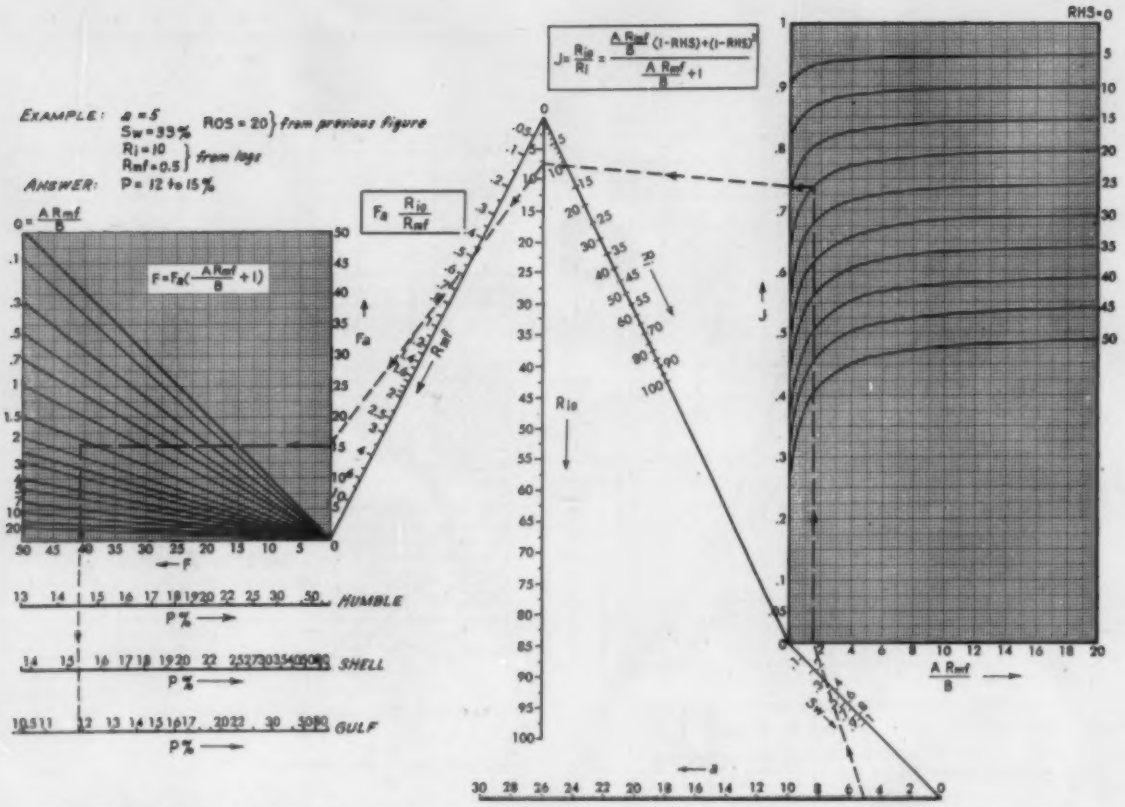
$$(A\,R_{mf}/B\,S_w) + R_{mf}/R_w = p$$

A plot is made of $S.P./K_c$ versus $a + R_{mf}/R_w = p$ for various R_{mf}/R_w (left-hand side of chart). Now dividing 9a into 9:

$$\frac{R_i}{R_t} = \frac{A\,S_w + (B\,S_w^2/R_w)}{A\,S_{wi} + (B\,S_{wi}^2/R_{mf})}$$

$$= \frac{(A\,R_{mf}/B\,S_w) + R_{mf}/R_w}{(A\,R_{mf}/B\,S_w)\times(S_{wi}/S_w) + (S_{wi}/S_w)^2}$$

$$= \frac{a + R_{mf}/R_w}{a\,(S_{wi}/S_w) + (S_{wi}/S_w)^2} \quad (19)$$



POROSITY OF SHALY SANDS is determined from value of a and S_w found by Fig. 8. R_i and R_{mf} are also needed. Fig. 9.

Define Q by $Q = a\,(S_{wi}/S_w) + (S_{wi}/S_w)^2$ and plot Q versus (S_{wi}/S_w) for various values of $(A\,R_{mf})/(B\,S_w) = a$ (right-hand side of chart). Then $R_i/R_t = p/Q$. (The directions for use of the chart are indicated by the arrows.)

It is noteworthy that our Equations 18 and 19 are identical with two equations given in a paper[18] by L. de Witte (his Equations 23 and 26), if in these equations the quantity $M_r/(S_w\,2m_{mf})$ is put = a.

The fact that the same results are obtained independently by two methods having different starting points and following rather dissimilar lines of reasoning may lend some credibility to these results if it is not just to be taken as proof of the hidden identity of two arguments which do not sound alike.

2. Porosity . . . Fig. 9 presents a chart for porosity determination in shaly sands. It is based on the relations:

$$1/R_{io} = A + B/R_{mf} \qquad (2a)$$

$$R_{io}/R_{mf} = F_a \qquad (3a)$$

$$F_m = F_a\,[(A/B)\,R_{mf} + 1] \qquad (5a)$$

F_m is related to porosity by any one of several empirical correlations. It is largely a matter of taste which one is preferred.

The construction of Fig. 9 may be sketched as follows. As a byproduct of the S_w determination, we get the quantity $a = A/B \times R_{mf}/S_w$ from Fig. 8. We can then find $(A/B)\,R_{mf}$ (multiplication by S_w on lower right-hand side of chart. Dividing Equation 2a into 9a:

$$\frac{R_{io}}{R_i} = \frac{A\,S_{wi} + [B\,(S_{wi})^2/R_{mf}]}{A + (B/R_{mf})}$$

$$= \frac{(A\,R_{mf}/B)\,(S_{wi}) + (S_{wi})^2}{(A\,R_{mf}/B) + 1} = J$$

We can plot J as a function of $(A\,R_{mf}/B)$ for various S_{wi} or ROS (right-hand side of graph). $J \times R_i = R_{io}$ and $R_{io}/R_{mf} = F_a$ (center of nomograph).

$$F_m = F_a\,[(A/B)\,R_{mf} + 1]$$

is plotted as a function of F_a for various $(A/B)\,R_{mf}$ (left-hand side of graph. Finally, F_m gives porosity by the correlation of one's choice: Humble, Shell, or Gulf.

Concluding Commentary

The trend of thought developed in the preceding paragraphs is decidedly inductive in character. The starting point lies in some basic, rather well-established experimental and empirical facts taken for granted without attempting to "prove" them by recondite theories or to explain them by intricate model representations.[30] The results of these observations have been generalized formally.

This kind of treatment is believed to be logically justified because it is consistent in method and goal. Inasmuch as the square-root relation, Equation 7 for example, is purely empirical and has never been theoretically derived from fundamental principles, it seems preposterous to strive for great rigor and refinement as has often been the tendency in subsequent developments which make use of it. It must be understood that in electric-log analysis no more than in many other branches of geophysics we are concerned with exact mathematics but with reasonable approximations.

It is to be borne in mind that the equations given here are only approximate. Moreover, considering the accuracy of the measured quan-

Notation

Symbol and meaning:

a = activity, gram molecule/liter
A = constant, $(\text{ohm-m.})^{-1}$
B = constant, dimensionless number
A/B = shaliness of sand, $(\text{ohm-m.})^{-1}$
c = concentration, gram. molecule/liter
E = electromotive force, volt
F = formation factor, dimensionless number
F_a = apparent formation factor, dimensionless number
F_m = maximum formation factor, dimensionless number
F = Faraday constant (electrical charge of 1 g. equiv.), coulomb (or ampere/sec.)
K = proportionality factor in S.P. equations, mv.
K_c = same for clean sand, mv.
K_{ct} = same at any particular temperature t, mv.
n = exponent, dimensionless number
R = gas constant/gram molecule, joule/deg. (or volt-amp.-sec./deg.)
R_i = resistivity of the invaded zone of a sand, ohm-m.
R_{io} = same if the sand is originally 100 per cent water bearing, ohm-m.
R_{mf} = resistivity of mud filtrate, ohm-m.
R_o = resistivity of completely water-saturated sand, ohm-m.
R_t = (true) resistivity of sand at any water saturation, ohm-m.
R_w = resistivity of interstitial water, ohm-m.
R_{wa} = "apparent" resistivity of interstitial water, ohm-m.
ROS = residual oil saturation in invaded zone, dimensionless number
S.P. = spontaneous potential, mv.
$S.P._c$ = same in clean sand, mv.
$S.P._s$ = same in shaly sand (at any water saturation), mv.
$S.P._{so}$ = same in shaly water sand (at 100 per cent water saturation), mv.
S_w = water saturation of sand, dimensionless number
S_{wi} = water saturation of invaded zone, dimensionless number
T = absolute temperature, degrees absolute
u = mobility of cation, $\text{cm.}^2/\text{volt-sec.}$
v = mobility of anion, $\text{cm.}^2/\text{volt-sec.}$
V = potential difference, volt
z = valence, dimensionless number

tities to be used in log interpretation in these or any other equations, it might as well be said once and for all that we cannot pretend to calculate saturation any closer than to the nearest 5 to 10 per cent or porosity any closer than to the nearest 2 to 5 per cent without willful self-deception. It is, in fact, rather remarkable that one should be able to come that close.*

Since the use of the charts (Figs. 8 and 9) ought to be self-evident I have refrained from giving a typical log example. Although, admittedly, the proof of the pudding is in the eating, it does not seem advisable to resort to so specious a device as to confer a semblance of proven validity on an argument that has been presented simply as a reasonable approach to the solution of a tough problem of long standing.

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*I hope to review the accuracy inherent in some standard log-interpretation techniques in a subsequent article which is now in preparation.

Tidewater Operates World's Largest Cat Reformer

ANOTHER major refining plant, the world's largest catalytic reformer, has begun operations at Tidewater Oil Co.'s new Delaware refinery.

This makes six complete manufacturing plants now on stream at the 130,000-bbl. per day refinery south of Wilmington, Del., company officials said. Five additional plants are still under construction.

The newly completed reforming plant produces high-octane components of automotive and aviation gasolines. Designed by Houdry Corp., it has a capacity of 45,000 bbl. per day.

The reformer is charged with naphthas, originating from the crude-distillation unit, from which sulfur and other impurities have been removed. It uses a platinum catalyst to rearrange the molecules of gasoline, thus greatly increasing their octane rating. After further processing, the reformate produced becomes one of the major components of high-octane gasoline designed to meet the requirements of both present and future automobile engines.

In addition to producing other intermediate products, the reformer manufactures byproduct hydrogen which is used in the hydrodesulfurization plant to remove sulfur and other impurities from gasoline and distillate stocks.

Tidewater officials have already announced the beginning of operations in five other key plants—the crude-distillation plant, the fluid catalytic cracking plant, the gas-recovery plant, the catalytic polymerization plant, and the alkylation plant.

Here's a method for

Evaluating D.S.T. Data

When a well is newly drilled into a producing formation, a drill-stem test can tell a good deal about what fluid and how much it will produce. But the drill-stem test can tell a lot more. It can yield reservoir pressure, well-bore damage, and average permeability. This article shows how.

Part 1 of 4 Parts

by Albin J. Zak, Jr., and Phil Griffin, III

THE drill-stem test, as originally conceived, was used solely as a qualitative measure of the reservoir fluids present in any given test interval. Quantitative applications of drill-stem test data were not considered possible until recent years. Now, greater-precision pressure-recording instruments and introduction of the pressure-buildup theory enable the use of the drill-stem-test data in determining the initial reservoir pressure, well-bore damage, and average formation permeability within the drainage area of the well.

At first, objections were raised to the quantitative use of a drill-stem test on the basis of the presence of too many mechanical deficiencies. Within the last 3 years these mechanical deficiencies have been corrected to a large degree, thus increasing the potentiality for the drill-stem test as a tool in reservoir engineering.

Author Zak, now in the Armed Forces, plans to return to Core Laboratories, Dallas, on completion of his tour of service. Author Griffin is with Johnson Testers, Inc., Houston.

OPEN HOLE TEST

JOHNSTON TESTERS, INC.

OFFICES: Houston, Texas - Los Angeles, California - Calgary, Canada

DATE

OPEN HOLE TEST NO. WELL:
FIELD COUNTY STATE
COMPANY
ADDRESS
TEST APPROVED BY
JOHNSTON OPERATOR TICKET NO.

GENERAL TEST DATA

TYPE TEST Conventional TOTAL DEPTH 4875'

1. Test Interval: 4800' To 4875'
2. Tool Open 1 Hrs. 35 Min
3. Initial Shut In Hrs. Min
4. Final Shut In Hrs. 30 Min
5. Choke: Top 1" Bottom 5/8"
6. Fluid Recovery 450' Total
7. Fluid Cushion: Type None Amount
8. Air Chamber Amount - Size:
9. Did Packer(s) Hold? Yes
10. Did Tool Plug? No Where?
11. Was Test Reversed Out? No

80' Slightly Oil & Gas Cut Drilling Mud
160' Oil & Gas Cut Drilling Mud
210' Gas Cut Salty Sulphur Water

REMARKS:

SURFACE INFORMATION

1. Blow: Fair immediately & through out test.
2. Maximum Surface Pressure 0 Did Well Flow? No

Description Or Rate of Flow	Time	Max. Pressure	Size Surface Choke
-	-	-	1"

MUD, HOLE, & TOOL DATA

MUD, HOLE & JOHNSTON TOOL DATA

MUD: Type Mud Weight 9.0 Viscosity 35
HOLE: Main Hole Size 8 3/4 Drill Pipe Size 4½ F.H. All
Rat Hole Size None
JOHNSTON TOOLS:
1. Packer(s): Type Bob Tail O.D. 2 7/8"&3½20 Type O.D.
Set At 4800' Set At
2. Extra Equipment:
Homco Safety Joint.

Number of Copies Requested: 6

Data Obtainable

The basic data obtained from a drill-stem test include:

1. A qualitative as well as quantitative description of the fluid contents of the test interval.

2. A complete pressure history of the test, including running in and pulling the tool.

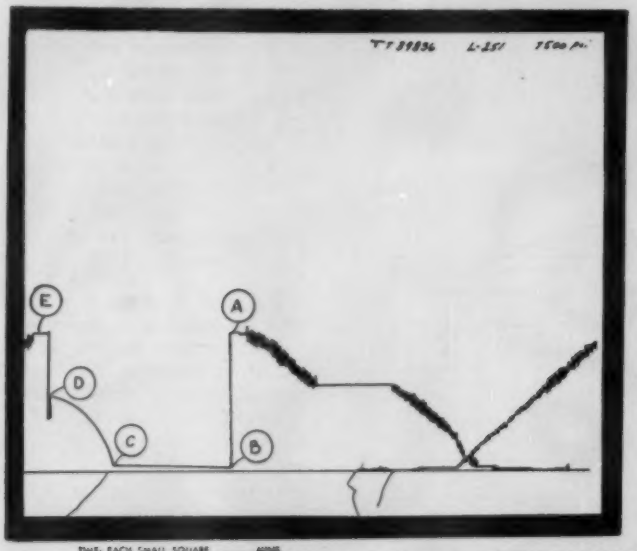
To aid in proper interpretation of the basic data, additional information is reported. This additional information includes the total depth of the well, thickness of the test interval, length of time tool was open and shut, bottom-hole choke sizes, mud weight and viscosity, hole size, and test tools used.

Not included is information concerning the type of mud used and its water-loss properties, the name of the formation tested, or the lithologic character of the test interval, i.e., whether a tight, shaly sand or a fractured lime. This added information if recorded along with the rest of the drill-stem test data would prove helpful in interpretation of the pressure-buildup data taken during the test.

Typical report . . . Fig. 1 shows a typical drill-stem-test report complete with all of the information usually included. At present, the incremental breakdown of the pressure buildup curve is an optional service offered to drill-stem-test customers who wish to make quantitative use of drill-stem data.

Of the data obtainable from a drill-stem test, the most useful, from a quantitative standpoint, is the pres-

DRILL-STEM-TEST REPORT not only shows fluid recovery as at left, but yields valuable pressure information below. Fig. 1.



TIME: EACH SMALL SQUARE ____ MINS.

Test Ticket No. 39836 Pressure Recorder: No. L-251
Chart Number: Cap. 7500
Location:
3 Minute Increments

PRESSURE DATA		Point	Pressure	Point	Pressure
A Initial Hydrostatic Mud	2350	C	250		
B Initial Flow	100	C 1	575		
C Final Flow	250	C 2	990		
D Final Shut-In	1700	C 3	1175		
E Final Hydrostatic Mud	2250	C 4	1325		
F "Initial Shut-In"		C 5	1425		
		C 6	1500		
Remarks:		C 7	1562		
		C 8	1612		
		C 9	1660		
		D	1700		

sure-buildup history obtained during the shut-in period of the test.

Initially, the pressure chart was used to check for plugging of tool assemblies which resulted in nonrepresentative fluid recoveries. However, with the advent of the pressure-buildup theory, the pressure history recorded during the shut-in period of a drill-stem test can provide valuable reservoir information even before the well is completed.

Use of pressure-buildup data will often permit determination of the original reservoir pressure, well-bore damage or skin, and when used in conjunction with the fluid recovery obtained during the test, the average reservoir permeability within the radius of drainage of the well. For this reason emphasis will be placed on the utilization of pressure data obtainable from the drill-stem test.

There are many methods available for the evaluation of buildup data. Perrine[1] objectively discussed and compared the methods of pressure-buildup analysis. Through his work, Perrine presented data which point out particularly important aspects of the analysis and serve to demonstrate the possibilities and limitations of the many methods of pressure-buildup analysis.

Pressure-buildup theory has been evolved for two sets of boundary conditions:

1. A small inner boundary of the reservoir over which the steady-state flow rate of a compressible fluid is constant. The outer boundary is assumed large but finite with either a constant pressure or no fluid influx across the boundary after shut-in.

2. A small inner boundary of the reservoir over which the steady-state flow rate of a compressible fluid is constant, but having an infinite outer reservoir boundary. The pressure is assumed constant at the outer boundary and the small inner boundary, representing the well bore, may be considered finite or vanishingly small.

Other Parts Will Cover . . .

Part 2: Shows typical drill-stem pressure curves and shows how pressure buildup theory fits test conditions.

Part 3: Tells how to use drill-stem-test data to determine reservoir performance.

Part 4: Described an empirical method for computing well-bore damage solely from drill-stem pressure-buildup information.

●

Case for new well . . . When a well, completed in a new and large reservoir, is shut in for pressure measurements, the second set of boundary conditions is most nearly fulfilled. For some time, the effect of production is not felt at the outer reservoir boundary, as if the well were completed in a reservoir of infinite extent.

Because of the short duration of the test and the relatively small reservoir fluid withdrawals during the test, the drill-stem test falls into this same category. Pressure disturbances created at the well bore are not felt at the outer reservoir boundary. For practical purposes the reservoir can be considered of infinite extent.

Since the drill-stem test seems to more nearly fit the second set of boundary conditions stated, discussion of the theory of pressure-buildup analysis will be limited to those basic methods of analysis which are based on the second set of conditions. The methods considered will be the Horner[2] method and the Hurst-van Everdingen[3 4] methods.

Assumptions . . . In addition to the reservoir conditions described in the aforementioned second set of boundary conditions, several additional, simplifying assumptions are required for mathematically rigorous derivation.

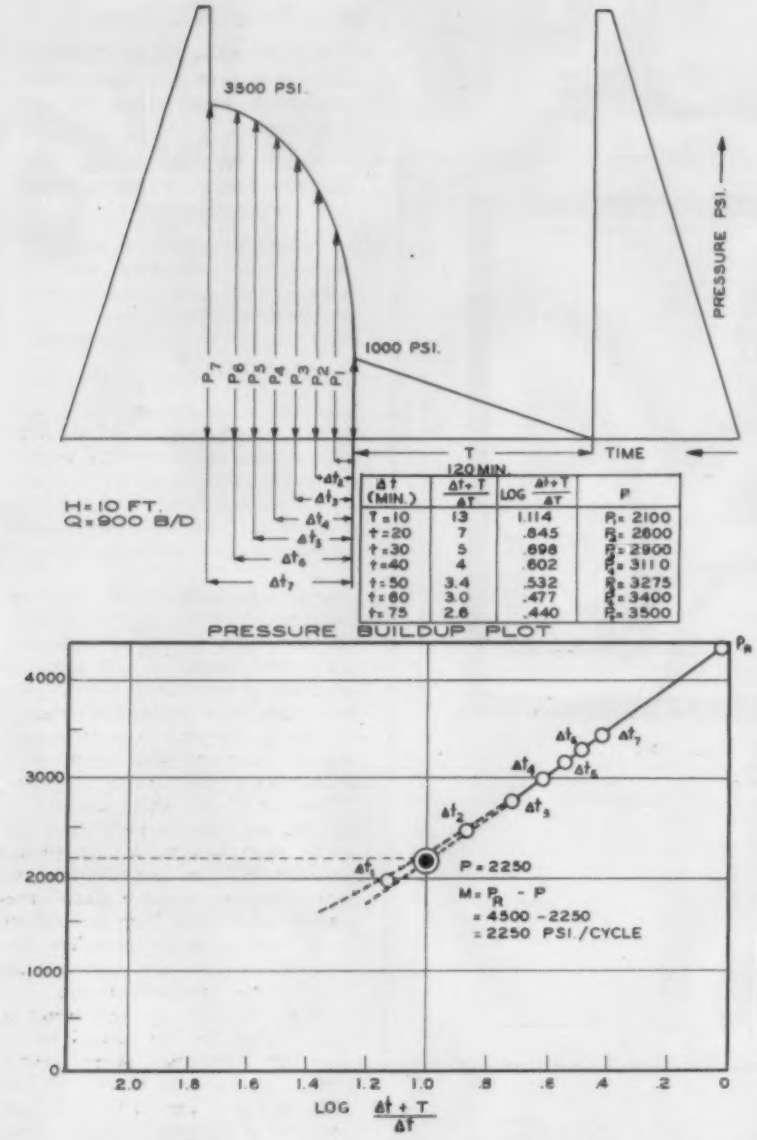
The assumptions involved are:

1. The reservoir is homogeneous, horizontal, and of equal thickness throughout.

2. The flow obeys Darcy's radial-flow formula neglecting entirely the effects of gravity.

3. The reservoir fluid is present in one phase only.

4. The compressibility and absolute viscosity of the reservoir fluid remain



PRESSURE BUILDUP portion of the drill-stem test is used to find reservoir pressure, well-bore damage, and average permeability. Pressure-time plot is Horner method of analysis. Fig. 2.

constant over the ranges of temperature and pressure encountered in the reservoir.

5. The fluid density varies exponentially, i.e.,

$$\rho = \rho_o e^{-c(P_o - P)}$$

where

ρ = density at some pressure P
ρ_o = density at some standard pressure P_o
c = compressibility (assumed constant)

Of these five basic assumptions seemingly by far the most crucial would be the one which requires the presence of a single-phase fluid. Permeability, viscosity, and compressibility are very sensitive to pressure changes below the bubble point. But even though the theory has been developed for the case where the reservoir pressure is above bubble-point pressure, results have shown that the equations frequently seem to apply equally well when the condition does not prevail.

The Horner method . . . Only that part of the Horner treatise dealing with pressure buildup in a single well in an infinite reservoir is to be considered here.

The basic equation of pressure buildup for the above conditions is:

$$P_w = P_o - (162.6\,Q\mu B)/Kh \times [\log(T+\Delta t)/\Delta t] \quad (1)$$

where:

P_w = pressure (psi.) at the well bore at time Δt after shut-in
P_o = initial reservoir pressure, psi.
Q = production rate in stock-tank bbl. per day
μ = fluid viscosity at reservoir conditions, cp.
B = reservoir volume factor
K = formation permeability, md.
h = producing interval, ft.
T = open-flow time, minutes
Δt = time after shut-in for buildup, minutes

Equation 1 concerns itself with a well produced at a constant rate Q from time zero to time T and then closed in; however, this condition is practically never obtained under normal well operation. Therefore, it becomes necessary to make some corrections to allow for the varying rates of production during the flow period.

Horner develops a relationship to accommodate these corrections, but concludes that the resulting equation is painstaking in its application and will be more precise than is warranted by other unavoidably present inaccuracies. Instead, Horner changes Equation 1 to

$$P_w = P_o - (162.6\,Q\mu B)/Kh \times [\log(T_e+\Delta t)/\Delta t] \quad (2)$$

where:

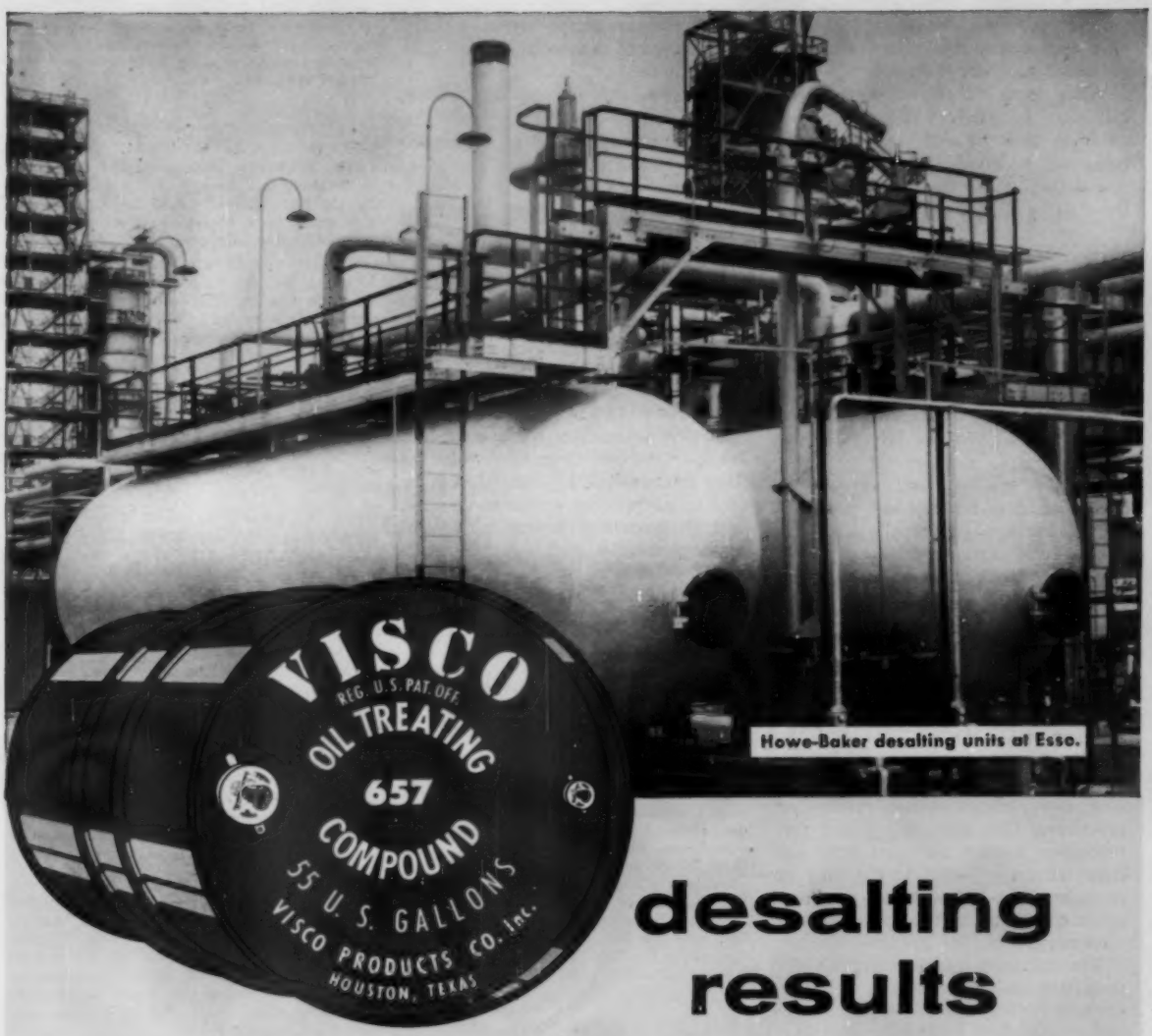
Q = last computed production rate prior to shut-in, (bbl. per day)
T_e = total cumulative production divided by Q

From the above equations, it immediately becomes evident that plotting pressure against log $(T_e+\Delta t)/\Delta t$ on semilog paper should yield a straight line after the effect of annular fillup has disappeared. If this is possible the following two very important deductions can be drawn:

1. Extrapolation of the straight line to $\log(T_e+\Delta t)/\Delta t = 0$ is equivalent to $\Delta t = \infty$, and enables reading $P_w = P_o$ which is identical to the initial reservoir pressure.

2. The slope of this straight line is equal to $162.6\,Q\mu B/Kh$. If Q, μ, B, and h are known, a direct computation of K may be made. This value of K is the mean value of permeability for the well-drainage area.

The theory described above is applicable in a strict sense only to an infinite reservoir which cannot actually exist. Nevertheless, Horner comments that the method can be applicable in a situation where a well has



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not yet produced sufficient fluid to have appreciably diminished the overall initial reservoir pressure.

When using the Horner method for drill-stem-test analysis T_c is equal to the open-flow time T, and Q is determined by dividing the cumulative production (total fluid recovered on the test) by T (Fig. 2).

Hurst-van Everdingen methods . . . The Hurst-van Everdingen methods of pressure-buildup analysis results from prior work done by these same authors which involves the application of the La Place transformation to reservoir problems.[5]

Although their established relations could be modified for effects of annular fillup, a comparison of these modified functions and actual observed pressure-buildup and pressure-drawdown data left much to be desired. Total pressure drop existing in a well has been observed to be somewhat greater than described by their p(t) functions.

In an attempt to bring about better agreement between theoretical and actual pressure drop existing in a well, Hurst and van Everdingen offered as an explanation the presence of a reduced-permeability zone near the well bore resulting from drilling, completion, and perhaps certain production practices. This zone of reduced permeability around the well bore has been termed a "skin" and it may be considered of infinitesimal thickness when compared to the total reservoir dimensions.

The equation of skin suitable for drill-stem-test work is:

$$S = 1.151\,[(P_o - P_f)/m - \log K/f\mu c r_w^2 - \log T + 2.85] \qquad (3)$$

where:

S = skin effect or well-bore damage, dimensionless
P_o = initial reservoir pressure, psi.
P_f = pressure at the well bore at the time of shut-in (flow pressure), psi.
m = slope of the buildup curve, psi./log cycle
K = average formation permeability within drainage radius of the well, md.
f = formation porosity, fractional
μ = fluid viscosity at reservoir conditions, cp.
c = fluid compressibility, volume/volume/psi.
r_w = well-bore radius, in.
T = open-flow time, minutes

Equation 3 is directly adaptable for use in connection with pressure-buildup data as taken from a drill-stem test. These equations, together with the slope relationship, Equation 1, can be used in calculating well-bore damage, average formation permeability. All results presented in this article utilizing drill-stem-test pressure-buildup information have been calculated from these relationships.

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1. Perrine, R. L., "Analysis of Pressure Buildup Curves," presented at spring meeting, Pacific Coast District, Division of Production, A.P.I., Los Angeles, May 10-11, 1956.

2. Horner, D. R., "Pressure - Buildup Wells," Proceedings of Third World Petroleum Congress, Section 11, E. J. Brill, Leiden, Holland, 1951, pp. 504-521.

3. Hurst, William, "Establishment of the Skin Effect and Its Impediment of Fluid Flow Into a Well Bore," Pet. Eng., Vol. 25, No. 11, October 1953, pp. B-6-B-16.

4. Van Everdingen, A. F., "The Skin Effect and Its Influence on the Productive Capacity of a Well," Jour. of Pet. Tech., Vol. 5, No. 6, pp. 171-176.

5. Van Everdingen, A. F., and Hurst, W., "The Application of the La Place Transformation to Flow Problems in Reservoirs," Trans. A.I.M.E. (1949), Vol. 186, pp. 305-324.

BOOKS

FOREIGN OIL Prepared by Burham & Co., 15 Broad Street, New York 5.

Here is a complete report on the organizational operating setup for foreign oil development as it is today with particular emphasis placed on the Middle East and the companies who operate in the Middle East. It is a nine-part report telling the story of future possibilities for foreign oil development.

Since approximately 75 per cent of the free world's oil reserves are lodged in the Middle East, and if anything like the growth in demand projected for the free foreign world develops, then most of this foreign oil must come from the Middle East. Therefore, oil in the Middle East has been reported at some length giving: (1) companies involved, (2) revenues accruing to these companies, (3) political risks, and (4) economic risks.

A complete prospectus is given for: (1) Royal Dutch-Shell Group, (2) British Petroleum Co., Ltd., (3) Burmah Oil Co., Ltd., (4) Compagnie Francaise des Petroles, and (5) Compagnie Financiere Belge des Petroles "Petrofina."

Any study of the oil industry today must underline the importance of the Middle East and according to this report, 24 per cent of the free world's production comes from the Middle East. It is not too much to say that 15 or 20 years hence the free world will be largely dependent on the Middle East for oil since at least 75 per cent of the known free world oil reserves are located there.

An organizational relationship of the Royal Dutch-Shell companies is explained in this report as well as the history and development of British Petroleum Co. Charts and tables give statistical data as to percentages of oil rights owned by the various companies and holding companies along with net profit and market evaluation.

BIBLIOGRAPHY OF NEW MEXICO GEOLOGY AND MINERAL TECHNOLOGY, 1950-1955, Bulletin 52, by Constance F. Schilling and John H. Schilling. Published by the State Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology, Socorro, N. M. 136 pp., $2.

This biliography lists index references relating to the geology and mineral technology of New Mexico that have appeared in the literature during 1950-1955. The service is a supplement to Bulletin 43 entitled, "Bibliography of New Mexico Geology and Mineral Technology Through 1950."

This new list includes published and unpublished material available to the general public. It is in two parts; the first lists the authors arranged alphabetically, and the second is an index giving an alphabetical list of subjects.

1956 SUPPLEMENT TO BOOK OF A.S.T.M. STANDARDS, Part 5, Fuels, Petroleum. Aromatic Hydrocarbons, Engine Antifreezes. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3. 320 pp. paper back.

This supplement contains the revised standards and the new and revised tentatives in these materials fields that have been accepted since the appearance of the 1955 A.S.T.M. Standards. Seven of the eight standards are replacements of existing standards, and one standard represents a tentative revised and adopted in 1956; similarly, of the 22 tentatives, 13 are replacements of existing tentatives, one represents a standard that has been revised and reverted to tentative, while eight are published for the first time.

THE POTENTIALS ABOUT A POINT ELECTRODE AND APPARENT RESISTIVITY CURVES FOR A TWO, THREE, AND FOUR-LAYER EARTH, by Harold M. Mooney and W. W. Wetzel. Published by University of Minnesota Press, Minneapolis 14. Text only, $4.50. Set of Curves only, $15.00. Complete $18.00.

This publication makes available for the first time a comprehensive collection of standard resistivity curves for a layered earth. It will be useful to anyone engaged in electrical resistivity exploration or in theoretical studies of electrical prospecting.

It includes all previous collections of published curves for the Wenner electrode configuration. The user will not need to refer elsewhere to complete his set of working curves. Apparent resistivity curves for approximately 2,300 two, three, and four-layer horizontal structures are included.

In addition, the basic potential data about a point electrode in computing the curves are presented as tables. These permit computation of standard curves for a great variety of other electrode configurations, such as nonsymmetrical resistivity spreads, three-electrode methods, and potential-drop-ratio methods.

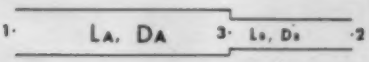
Finally, the graphical integration procedures are described in detail, including auxiliary tables which reduce the process to addition and multiplication.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Complex Liquid Gathering Systems

by Dr. John M. Campbell

THE situation often arises when it is convenient to use several diameters of pipe in series. Fluid principles may also be applied in this case after proper analysis of the conditions present.



In the above sketch L and D represent the length and diameter respectively of two different size lines joined in series. Therefore:

$$Q_{LA} + Q_{LB} = Q_{L\ Total}$$

and

$$\Delta P_{fB} + \Delta P_{fA} = \Delta P_{f\ Total}$$

However, no one equation may be written between points (1) and (2) because of the varying diameter. It should be possible to write an equation for section 1-3 and one for 3-2, solve each for Q_L and permit one to solve for the remaining unknown P_3.

A more flexible and convenient solution is afforded by determining a single-diameter line that is equivalent to the system shown. The equation

$$\Delta P_f = \frac{32\, f\, L\, Q_L^2\, \rho}{\pi^2\, g\, D^5}$$

may be written for one section. Then the equation is written for a hypothetical section having the same diameter as the other section but of such length that the friction drop is the same as that first written. Then:

$$\Delta P_f' = \frac{CL'}{D_A^5} = \Delta P_{fB} = C\frac{L_B}{D_B^5} \quad (1)$$

where L′ is defined as the length of line of diameter D_A that will give the same friction loss as L_B feet of line D_B.* If the constants are canceled and Equation 1 rearranged:

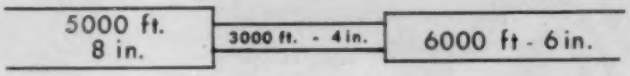
$$L' = L_B\,(D_A/D_B)^5 \quad (2)$$

If D′ is defined as the diameter of line of length L_A that will give the same friction loss as L_B feet of line D_B, Equation 1 may be rearranged to yield:

$$D' = D_B\,(L_A/L_B)^{1/5} \quad (3)$$

Equation 2 is particularly useful, for the system shown may then be regarded as consisting of $L' + L_A$ feet of line of diameter D_A. Once this equivalence is established the problem may be solved in the conventional manner.

Example . . . Express the equivalent length of the following system in terms of 4-in. pipe, assuming that the nominal diameter is equal to the actual inside diameter.



Solution . . . Expressing the diameter in terms of 4-in. pipe is arbitrary for it could also be expressed in terms of the 8-in. or 6-in. From Equation 3:

$$L'_{4"} = (5{,}000)\,(4/8)^5 + (6{,}000)\,(4/6)^5$$

$$= 156 + 790 = 946 \text{ ft.}$$

$$\text{Total length} = L'_{4"} + L_{4"} = 946 + 3{,}000 = 3{,}946 \text{ ft.}$$

The system shown may therefore be considered as equivalent to one consisting of 3,946 ft. of 4-in. pipe. Capacity or pressure-drop calculations may then be made on the latter system using the correlations previously presented.

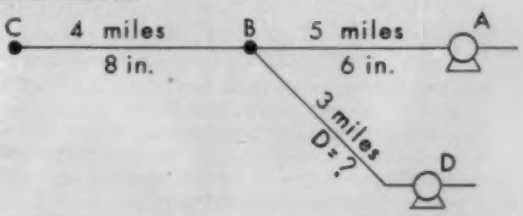
Complex Systems

Most gathering systems contain one or more branch lines. On a system of this type no single "recipe" is possible because of the innumerable variations possible but application of the principles presented (Parts 27-30) will enable one to calculate the necessary information, provided minimum needed data are available.

The problem below is a simple case that illustrates the general type of problem that often occurs.

Example . . . A gathering line, 9 miles long, has been laid to handle 25,000 bbl. per day of 35° A.P.I. crude oil (17.16 cp.) and is made up of 5 miles of 6-in. pipe, on the upstream end and 4 miles of 8-in. pipe. Later it is decided to tie in another line at the junction of the 6-in. pipe and 8-in. pipe, the new line being 3 miles long and shall handle 10,000 bbl. per day of the same crude oil from an extension of the same field.

Calculate the size of the new line with the limitation that the maximum working pressure of the new pump shall not exceed the maximum working pressure of the pump at the head of the 6-in. line. What are the maximum theoretical horsepower requirements for both pumps assuming atmospheric suction?



Solution . . . In effect the problem states that ΔP_{DB} is to equal ΔP_{AB}. Therefore if ΔP_{AB} is calculated it may in turn be used for line DB. The pressure drop in BC is common to both and may be added to determine the total pressure at points C and D.

Considering 8-in. line (BC): Capacity = 35,000 bbl./day of 35° A.P.I. crude.

μ = 17.16 cp. or 0.01153 lb./ft.-sec.

*The C term is not strictly constant for lines of different diameters since it includes the variable f. The error in assuming C constant is small provided the difference in pipe diameters is not large. For highest precision, the diameter exponent of 4.828 should be used rather than 5.

Author is chairman, School of Petroleum Engineering, University of Oklahoma, Norman.

$\rho = (0.85)\ (62.4) = 53$ lb./ft.^{3}

$D = 8.07/12 = 0.673$ ft.

$$v = \frac{(35{,}000)\ (5.61)}{(24)\ (3{,}600)\ (0.785)\ (0.673)^2}$$

$= 6.4$ ft./sec.

$L = (4)\ (5{,}280) = 21{,}120$ ft.

$$Re = \frac{(0.673)\ (6.4)\ (53)}{0.01153} = 19{,}750$$

and $f = 0.0075$

$$\Delta P_{BC} = \frac{(2)\ (0.0075)\ (21{,}120)\ (53)\ (6.4)^2}{(32.2)\ (0.673)}$$

$= 31{,}700$ lb./ft.^{2} or 220 lb./in.^{2}

Considering 6-in. line (AB): Capacity = 25,000 bbl. per day—same crude.

$D = 0.506$ ft.

$$v = \frac{(25{,}000)\ (5.61)}{(24)\ (3{,}600)\ (0.785)\ (0.506)^2}$$

$= 8.08$ ft./sec.

$L = (5)\ (5{,}280) = 26{,}400$ ft.

$$Re = \frac{(0.506)\ (8.08)\ (53)}{0.01153} = 18{,}760$$

and $f = 0.0076$

$$\Delta P_{AB} = \frac{(2)\ (0.0076)\ (26{,}400)\ (53)\ (8.08)^2}{(32.2)\ (0.506)} = 85{,}100 \text{ lb./ft.}^2 \text{ or } 591 \text{ lb./in.}^2$$

$\Delta P = 31{,}700 + 85{,}100$

$= 116{,}800$ lb./ft.^{2} or 810 lb./in.^{2}

According to stated problem, pump at D is to put up same ΔP as pump at A, so:

$\Delta P_{BD} = 85{,}100$ lb./ft.^{2}

$L = (3)\ (5{,}280) = 15{,}840$ ft.

$$Q = \frac{(10{,}000)\ (5.61)}{(24)\ (3{,}600)} = 0.65 \text{ ft.}^3\text{/sec.}$$

Using the chart for pipeline size in Part 29:

$$\frac{(\Delta P_f\ g/L)^{1/2}\ \rho^2\ Q^{3/2}}{\mu^{5/2}} = \frac{[(85{,}100)\ (32.2)/15{,}840]^{1/2}\ (52)^2\ (0.65)^{3/2}}{(0.01153)^{5/2}}$$

$$= \frac{(13.4)\ (2{,}800)\ 0.524)}{0.0000143} = 1.37 \times 10^9$$

Then:

$$Re = 12{,}000 = \frac{Q\rho}{0.785\ D\mu}$$

$$= \frac{(0.65)\ (53)}{(0.785)\ (D)\ (0.01153)}$$

$$D = \frac{(0.65)\ (53)}{(0.785)\ (12{,}000)\ (0.01153)}$$

$= 0.317$ or 3.8 in. Take 4-in. pipe.

ΔP using 4-in. pipe:

$D = 4.03/12 = 0.336$ ft.

$$v = \frac{(10{,}000)\ (5.61)}{(24)\ (3{,}600)\ (0.785)\ (0.336)^2}$$

$= 7.32$ ft./sec.

$$Re = \frac{(0.336)\ (7.32)\ (53)}{0.01153} = 11{,}300$$

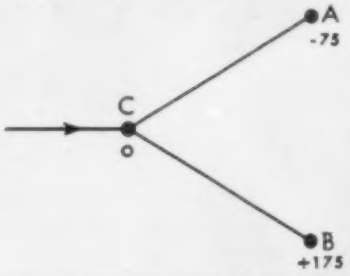
and $f = 0.0086$

$$\Delta P_{DB} = \frac{(2)\ (0.0086)\ (15{,}840)\ (53)\ (7.32)^2}{(32.2)\ (0.336)} = 71{,}500 \text{ lb./ft.}^2 \text{ or } 796 \text{ lb./in.}^2$$

$$Hp._D = \frac{(0.65)\ (103{,}200)}{550} = 122 \text{ hp.}$$

$$Hp._A = \frac{(1.624)\ (116{,}800)}{550} = 345 \text{ hp.}$$

Split flow . . . A common problem also encountered is where the flow from a single line is split into two or more parts as in the figure below.



In the rare case where the pressures and elevations at A and B are equal this may be handled as a loop problem—in all others the calculation of flow is theoretically a trial and error process. However, this tedious approach may usually be eliminated by the following method:

1. Assume a pressure at point C that is high (greater than 100,000 lb./ft.^{2}).
2. Calculate ΔP_f for lines CA and CB.
3. Using the correlation:

$$(D/\mu)\ [\tfrac{1}{2}\ D\ g\ \rho\ (\Delta P_f/L)]^{1/2}$$

vs. $\rho v/[\tfrac{1}{2}\ D\ g\ \rho\ (\Delta P_f/L)]^{1/2}$

(Part 30) calculate Q_L for both lines.

4. Knowing the total flow rate at C and the relative Q_L's from (3) above, calculate the actual flow rate for each line.
5. Using the actual flow rates from (4) above calculate ΔP_f for lines CA and CB using the correlation of f vs. Re (Part 28).
6. Calculate pressure at C for both lines.
7. If the two pressures at C check within a few per cent the actual flow rates calculated in (4) above may be used. If not, a new value must be assumed for the pressure at C and the process repeated.

In most instances the above process is only necessary one time, particularly if the pressure at C is assumed high enough. It will often work even if the assumed pressure and that calculated in Step 6 differ widely. As a rule of thumb the assumed pressure should be about 15 times the maximum elevation change, expressed in pounds per square foot. **End.**

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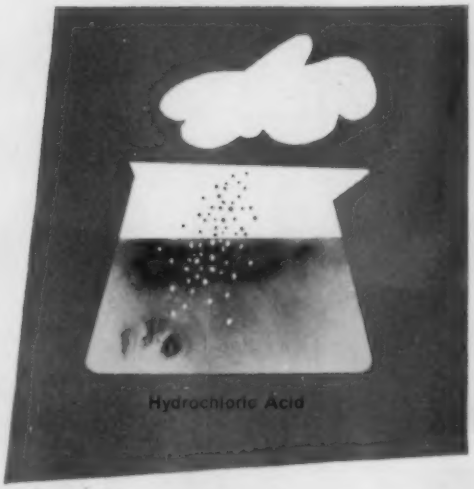

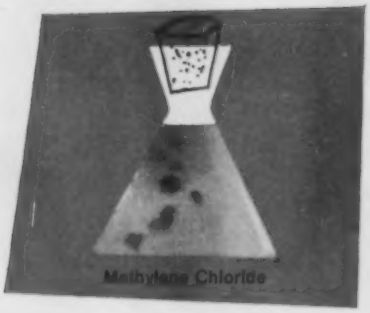

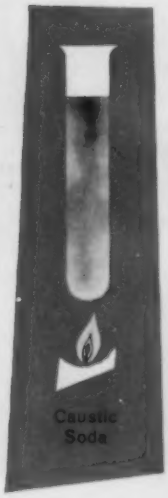

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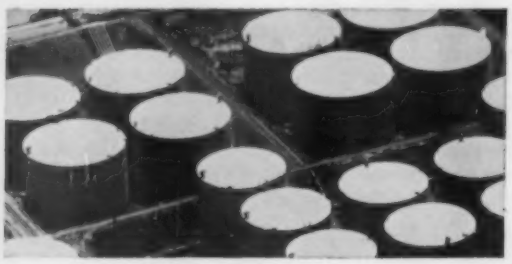

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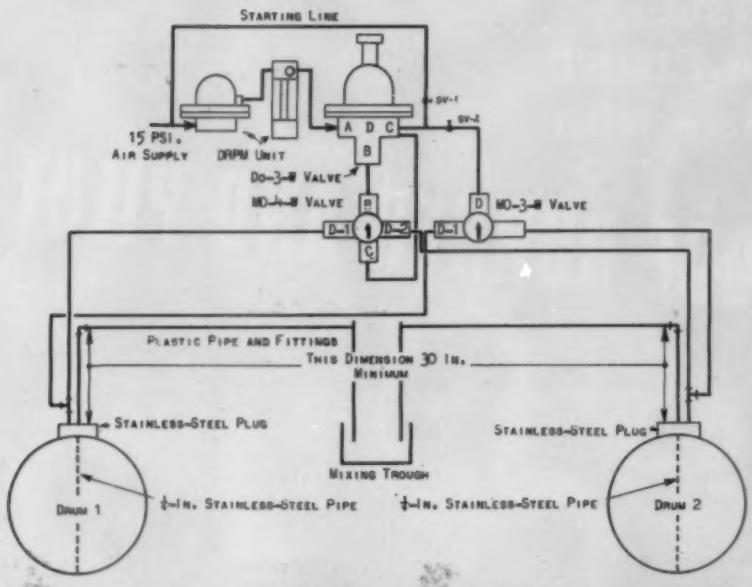

ACID FEEDER and automatic drum switcher. DPRM—Differential pressure regulator and meter; DO-3-W—diaphragm-operated three-way valve; MO-3W—manually operated three-way valve; MO-4-W—manually operated four-way valve; SV-1—starting valve 1; SV-2—starting valve 2. All piping not designated may be ¼-in. copper tubing.

Automatic switching device feeds Acid to cooling-tower water

WHEN sulfuric acid is fed to cooling towers direct from drums in which acid is received, a drum seldom empties at a convenient time for someone to be there and switch to another drum.

Presented here is a Bill of Materials, schematic drawing, and description of operation of a method used by La Gloria Oil & Gas Co. to feed acid to cooling-tower makeup water and to automatically switch to a full drum when one becomes empty. Total cost should not exceed $150 per cooling-tower feeding system.

Bill of Materials

1. Flat-bottom trough 12 ft. long with cleats on bottom. Makeup water is fed into one end of trough and runs over cleats to cooling-tower basin. Acid and any other chemicals fed should be fed to trough at end where water enters. The cleats in trough provide thorough mixing of makeup water, acid, and chemicals before reaching cooling-tower basin.

Material furnished by Homer C. Givens, plant superintendent, La Gloria Oil & Gas Co., Talfurrias, Tex.

2. One differential-pressure-regulator flow-meter unit, designated D.P.R.M. (Part No. 2673, Moore Products Co., H and Lycoming Streets, Philadelphia 24, Pa., or Fig. 690-132 Fischer & Porter Co., 546 County Line Road, Hatboro, Pa., or similar).

3. One diaphragm operated three-way valve designated DO-3-W (Type 164A-1 Fisher Governor Co., Marshalltown, Iowa, or similar).

4. Two ¼-in. manually operated shutoff valves. Any good valve that will shut off bubble tight and not leak around packing. The valves are to be used as initial starting valves and are designated as SV-1 and SV-2.

5. One manually operated three-way valve designated MO-3-W (Republic Manufacturing Co., 15655 Brookpark Road, Cleveland 11, Ohio, Part No. 703-3-¼ or similar).

6. One manually operated four-way valve designated MO-4-W (Republic Manufacturing Co., Part No. 703-6-¼ or similar).

7. Two stainless-steel plugs threaded to screw into bunghole of acid drum. Also through center of each plug there should be a hole with ¼-in. NPThreads in both ends. A piece of ¼-in. stainless-steel pipe is screwed into end of plug that will be inside of drum, and of sufficient length to reach bottom of drum (approximately 22 in.). Also plug should have hole through it with end of hole tapped ¼ in. N.P.T. on end of plug that will be outside of drum. Inlet air pressure is connected to this opening.

8. Several feet (depending on distance of drums from mixing trough) of acid resisting ½-in. plastic pipe.

9. Two ½ by ¼-in. acid-resisting plastic swages.

10. Two ½-in. acid-resisting plastic ells.

11. Two ½-in. acid-resisting plastic tees.

12. Two ½-in. acid-resisting plastic collars.

13. Sufficient ¼-in. copper tubing and flared fittings.

Hookup . . . Drums are designated as D-1 and D-2. The D.P.R.M. comes with connection diagram. The DO-3-W valve ports are marked A, B, C, and D.

The ports in MO-3-W and MO-4-W valves are not marked but should be as soon as received. The proper method to mark the MO-3-W valve is to hold it looking at top with side port away from person holding it. Side port should be marked D, left port D-1, and right port D-2.

The MO-4-W valve should be held looking at the top, turn handle counterclockwise to stop, and if necessary, turn valve until pointer on handle points away from person holding valve. Port, pointer indicates should be marked B and opposite port should be marked C. Left port and right port should be marked D-1 and D-2 respectively. The marking of these valves is very important when connecting apparatus.

Refer to schematic diagram to help understand connection details.

A constant 15-psi. air supply is connected to inlet of D.P.R.M. Also a line from the 15-psi. supply should be connected with SV-1 in it, to D in DO-3-W valve.

The output from D.P.R.M. is connected to A in DO-3-W valve, and B and C in DO-3-W valve are connected to B and C in MO-4-W valve respectively. D in MO-3-W valve is connected to D in DO-3-W valve. SV-2 should be in line connecting these two openings.

Openings D-1 and D-2 in MO-3-W and MO-4-W valves are connected to

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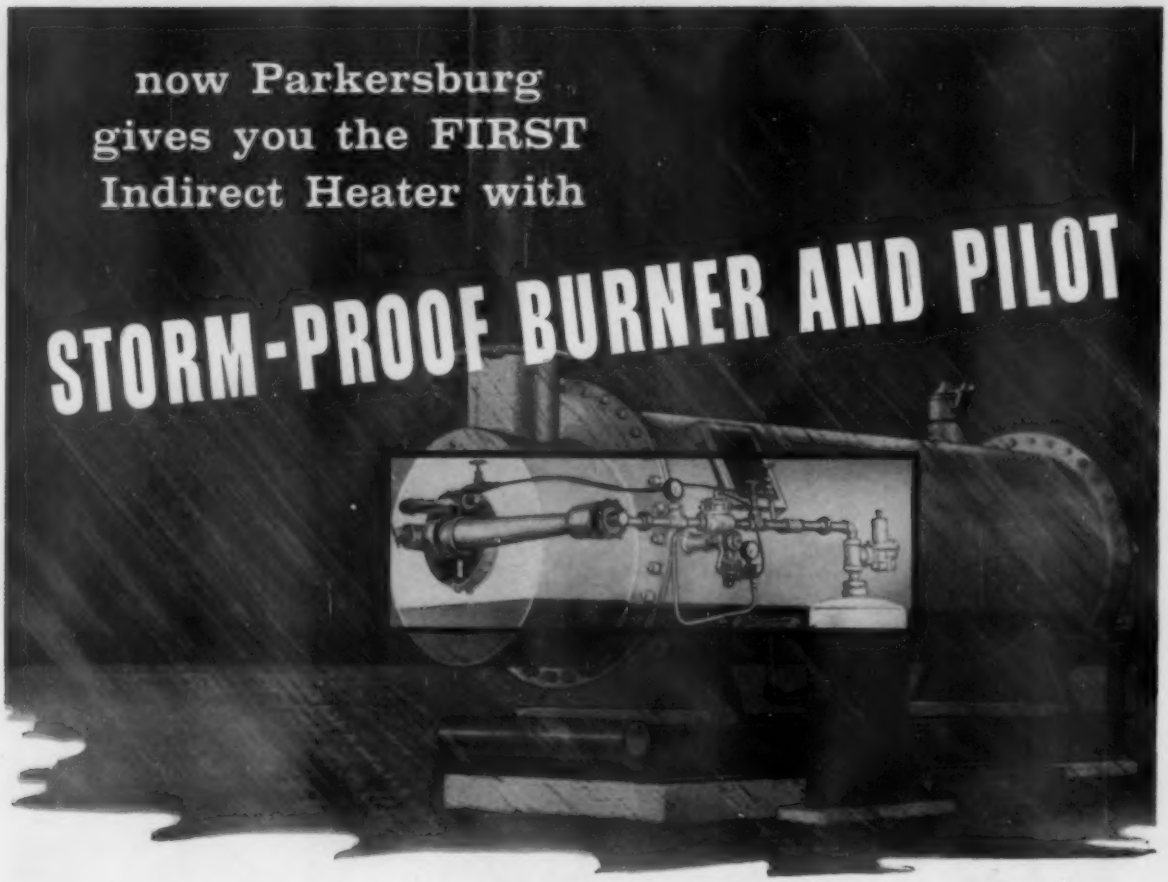

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5. **Easier operation**

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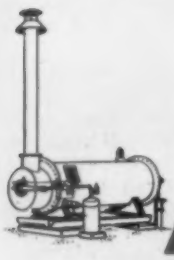

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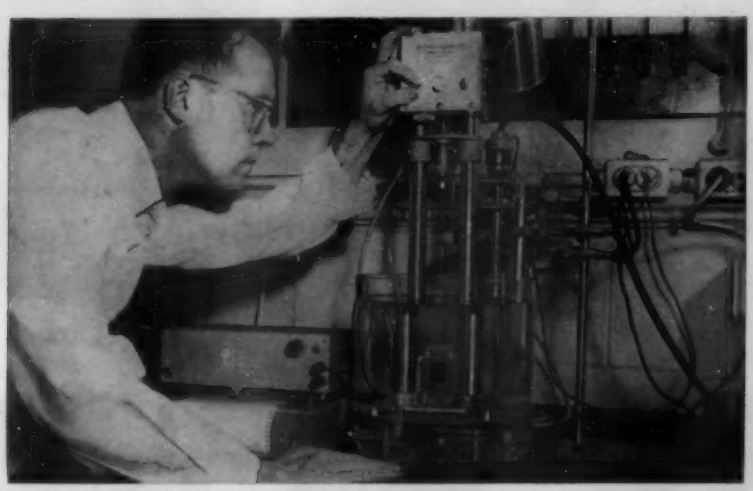
pressure-inlet opening in plugs going into Drum 1 and Drum 2 respectively.

The plastic swages are screwed into center hole in stainless-steel plugs and plastic collars screwed on swages. A piece of plastic pipe not less than 30 in. long is screwed into each collar, a plastic ell is screwed on to each piece of plastic pipe, and a sufficiently long joint of plastic pipe to reach from drum to trough is screwed into each ell. A plastic tee is placed bullheaded on each pipe end over trough with run of tee vertical, and a piece of pipe from tee down into trough. A small riser should be placed in tee upward. This is to act as a syphon breaker.

Operation . . . Feeder is now ready for operation. Assume both drums full of acid and Drum 1 is to be used first.

1. Spring adjustment on DO-3-W valve set at minimum.
2. Pointer on handle of MO-4-W valve indicating B.
3. Pointer on handle of MO-3-W valve indicating D.
4. Close SV-2 and open SV-1.
5. Turn on 15-psi. air supply.
6. Adjust flow through D.P.R.M. with needle-valve adjustment built into D.P.R.M.
7. When acid starts feeding close SV-1 and open SV-2.
8. Adjust flow of acid to desired rate by adjusting air flow through D.P.R.M. With experience the rate of acid can be set by merely setting the air-flow rate.
9. When Drum 1 empties pressure in drum will fall to 0 thus reducing pressure under diaphragm of DO-3-W valve to 0 also, which allows DO-3-W valve to close port B and open port C. This starts acid feeding from Drum 2.
10. At a convenient time the empty drum can be replaced by a full one.
11. After the full drum has replaced the empty one the MO-4-W valves are turned so pointer indicates ports marked D-2. DO-3-W valve then will need to be started again as it was the first time. Thus Drum 2 will empty and switch to Drum 1 will be automatically made.

The DO-3-W valve requires 2 psi. change in pressure under diaphragm to work properly. This is the reason for the 30-in. riser on acid outlet pipe from drums.



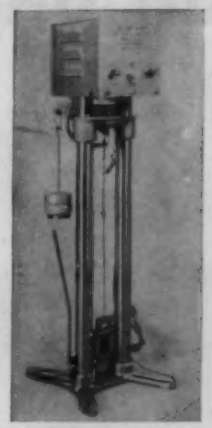
THE MICROVISCOMETER is designed for immersion in a standard laboratory water bath.

New instrument measures asphalt viscosity

THE problem of rapidly measuring viscosity of asphalt pavement over the wide temperature range to which it is subjected has been solved by Shell Development Co.'s Emeryville Research Center.

Members of the bitumen department in collaboration with instrumentation-department men have devised the sliding-plate microviscometer which makes such viscosity measurements in absolute units.

Viscosity changes . . . Research was undertaken to discover a means of calculating viscosity changes. On hot days the asphalt pavement must not shove or flow. On cold days the paving must not crack under repeated use by heavy trucks. Asphalt viscosity varies under these temperature changes. To facilitate research in developing an ideal asphalt pavement which will not fail under hot-cold changes the microviscometer was devised.



DETERMINING viscosity at various temperatures is the task of the microviscometer.

The mechanism was found to be of general use in asphalt-testing laboratories and so was designed for use in constant-temperature baths normally found in such labs.

Rates of shearing . . . Determining viscosity at various temperatures and rates of shearing is the task of the microviscometer. It combines the simplicity of the classical concept of viscosity—shearing a sample between two parallel flat plates—with the sensitivity and accuracy of an electronic circuit for measuring movement. Only 10 mg. of sample is needed to measure flow properties of asphalt being tested

The microviscometer is designed for immersion in a standard laboratory water bath. The sample is placed in a thin layer between two polished glass plates. One plate is stationary while the other is attached to the end of a balance beam. A load placed on the other end of the beam causes the plates to move past one another.

Displacement of the sliding plate is followed by a simple resistance-contact servo system. The servo motor drives a micrometer, causing it to maintain a high-resistance contact between the mike's point and a flag attached to the sliding plate.

A graphical displacement record is obtained on a millivolt recorder attached to the microviscometer.

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For all their size and built-in stamina, these Autocars are engineered as carefully as precision timepieces—balanced wheels and driveshafts, nuts-and-bolts instead of rivets, complete installation of replaceable bushings, heat-treated alloy steel frames built up to meet the stresses to be expected under your special hauling conditions.

Autocar 6-wheelers are built to last, to perform profitably long after lesser trucks have outlived their usefulness. There are dozens of reasons why they are doing dozens of different jobs in the field, dependably and economically. Ask your Autocar-White distributor for further information about these versatile, heavy-duty trucks and tractors—the Autocar 6-wheelers.

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Here's an Autocar-Diesel 6-wheel truck loaded with a draw-works used for deep drilling. It hauls loads up to 90,000 lb.

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An Autocar-Diesel 6-wheel tractor hitched to a low-bed trailer loaded with a 39-ton portable drilling rig.

This Autocar-Diesel 6-Wheeler tractor is transporting a cracking plant tower. Owned by Texas Engineering Construction Co., Corpus Christi, Tex.

by B. L. McIntire
The Datics Corp.

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ELECTRONIC COMPUTERS

Using Electronic Computers in the Oil Industry — Part 8

How to Calculate the Theoretical Tray

APPLICATION of an automatic digital computer to the calculation of fractionators involves a grossly different mathematical approach from that used with desk techniques. Since a very large amount of coding and programing is required, a completely general algorithm is necessary. The approach given here was presented originally at the Pittsburgh meeting of the American Institute of Chemical Engineers[1] and has since been slightly refined.

Fig. 1 is a sketch of the theoretical tray, the m tray, to be considered. We intend to present the equations for calculating through this tray in a downward direction. All enthalpy and equilibrium data are stored in the computer in the form of curve fitted constants as a function of temperature.[2]

Calculating downward, assume that we have reached a point where the composition and temperature of the m+1 liquid is known. It is possible to compute directly the molal average enthalpy of this liquid, H_{Lm+1}. The machine is now instructed to guess simultaneously the values for both V_m, the vapor rising from the mth step, and for T_m, the temperature of the mth step. (The values obtained on the m+1 step can be used as a first approximation.)

If these two values are assumed correctly, the problem is finished. However, we must check the assumption by substituting into the following two functions:

$$\Psi_1 = 1 - \frac{1}{V_m}\Sigma\frac{(V_m-\Delta)\,x_{m+1}+\delta}{K} \quad (1)$$

$$\Psi_2 = 1 - \frac{(V_m-\Delta)\,\Sigma\,h_{Vm}\,x_{m+1} + \Sigma\,h_{Vm}\,\delta - \Delta Q}{(V_m-\Delta)\,H_{Lm+1}} \quad (2)$$

These functions approach zero as the dew point and the heat balance, respectively, are satisfied. A complete machine procedure requires a method for improving the estimates of V_m and T_m.

The changes in V and T that are required can be determined by solving a set of linear simultaneous equations.[3]

$$a(\Delta T) + b(\Delta V) = \Psi_1 \quad (3)$$

$$c(\Delta T) + d(\Delta V) = \Psi_2 \quad (4)$$

In Equations 3 and 4, the coefficients are the partial derivatives of the functions Ψ_1 and Ψ_2 with respect to the unknowns T and V.

$$a = (1/V_m)\,\Sigma\frac{(V_m-\Delta)\,x_{m+1}+\delta}{K'} \quad (5)$$

$$b = (-1/V_m)\left[\Sigma(x_{m+1}/K) + (1/V_m)\,\Sigma\frac{(V_m-\Delta)\,x_{m+1}+\delta}{K}\right] \quad (6)$$

$$c = -\left[\frac{(V_m-\Delta)\,\Sigma\,h_{Vm}'\,x_{m+1} + \Sigma\,h_{Vm}'\,\delta}{(V_m-\Delta)\,H_{Lm+1}}\right] \quad (7)$$

$$d = \frac{\Sigma\,h_{Vm}\,\delta - \Delta Q}{H_{Lm+1}\,(V_m-\Delta)^2} \quad (8)$$

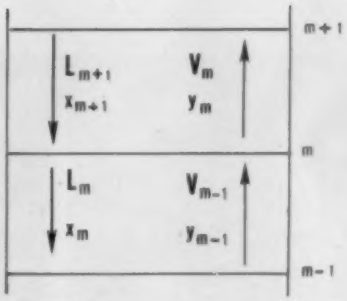
Note that the derivatives of the K and h functions with respect to temperature are required in Equations 5 and 7. Since the machine has stored in memory the empirical constants representing these curves, information to calculate their slopes is also available to the computer.

Thus, after evaluating Equations 1 and 2 and 5 through 8, the new trial values of T and V can be computed with Equations 9 and 10.

$$T_m(\text{new}) = T_m - \Delta T_m \quad (9)$$

$$V_m(\text{new}) = V_m - \Delta V_m \quad (10)$$

This series of calculations can be repeated until the theoretical step is



SKETCH of the theoretical tray, the m tray, to be considered. Fig. 1.

in complete heat, material and equilibrium balance.

The process is made continuous by three cleanup equations. These equations provide the computer with sufficient information to begin calculations on the m−1 step.

$$x_{m+1}(V_m-\Delta) = l_{m+1} \quad (11)$$

$$l_{m+1} + \delta = v_m \quad (12)$$

$$v_m/K_m\,V_m = x_m \quad (13)$$

A similar set of equations has been derived for calculating step-by-step in an upward direction.[1] In this case, the iterative portion starts with the values of y_{m-1} and T_{m-1} known. The method converges rapidly on the required values of V_{m-1} and T_m.

The next succeeding article in this series will give a detailed block diagram for solving Equations 1 through 13 on an electronic computer and will contain a table on nomenclature.

Subscripts

m = any given step in the column
L = liquid phase
V = vapor phase

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1. Shelton and McIntire, "Fractionator Design With Automatic Computing Equipment II, Feed Mesh Method." Presented at A.I.Ch.E. national meeting, Pittsburgh, 1956.
2. McIntire, R. L., PETROdatics No. 5, The Oil and Gas Journal, p. 122, March 4, 1957.
3. Scarborough, "Numerical Mathematical Analysis." Johns-Hopkins Press, pp. 187-190, 1930.

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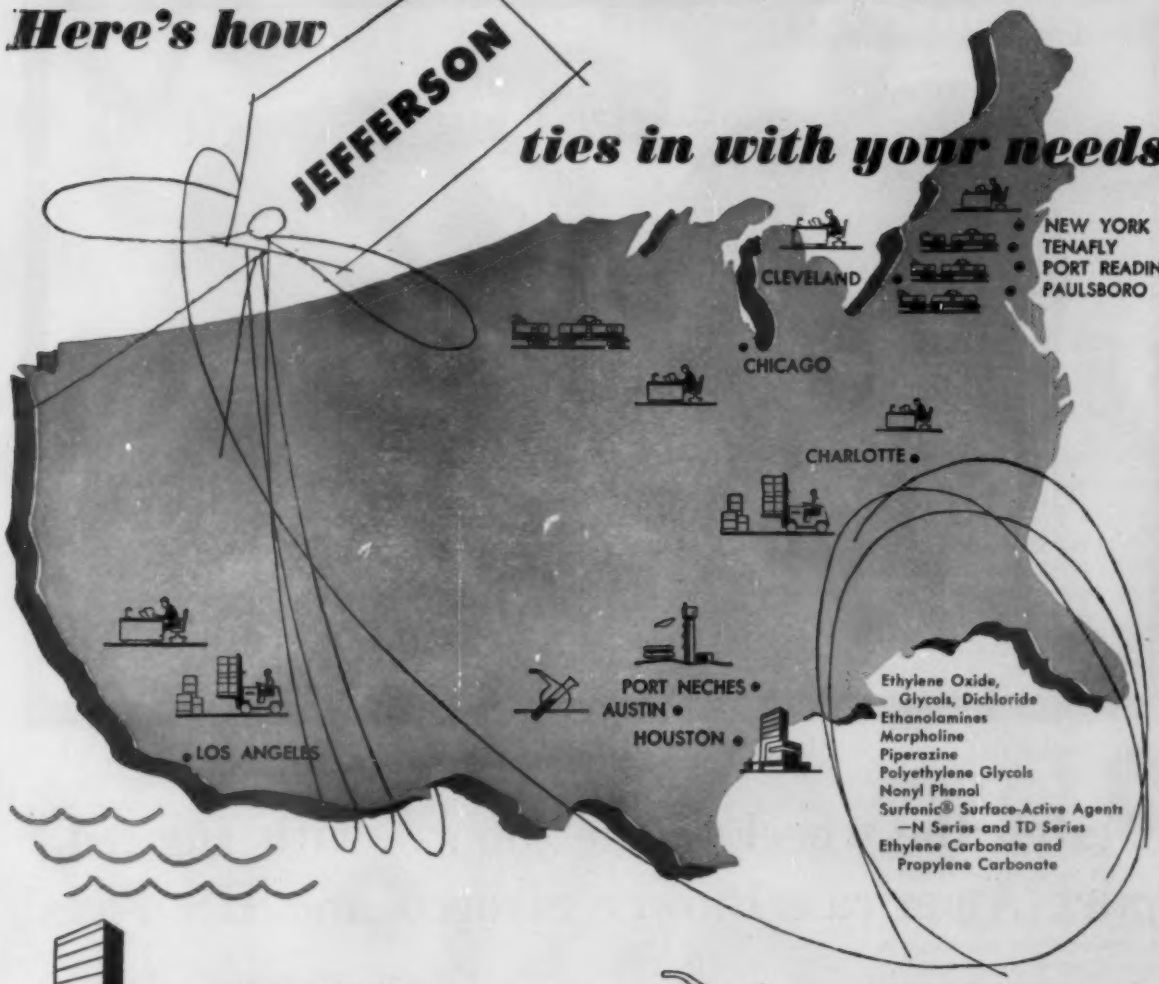

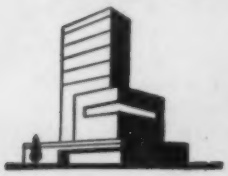

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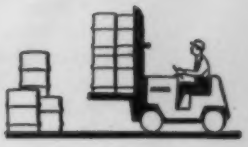

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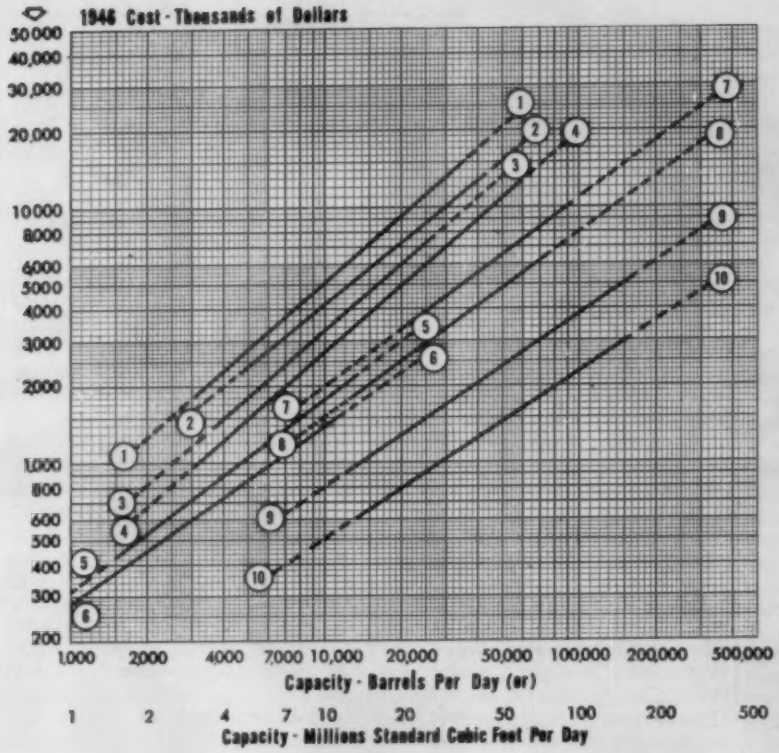
28. Over-All Plant Costs—

Cracking, Natural Gasoline, etc. (Approximate)

by W. L. Nelson
Technical Editor



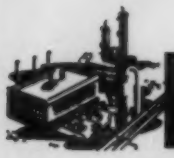
NELSON REFINERY CONSTRUCTION COST INDEX*

	Material	Labor	M&L
1946	100	100	100.0
1947	122	113	117.0
1948	139	128	132.5
1949	144	137	139.7
1950	149	144	146.2
1951	164	152	157.2
1952	164	163	163.6
1953	172	174	173.5
1954	175	183	179.8
1955	176	190	184.2
1956	190	192	195.3

*The Oil and Gas Journal, July 7, 1952, p. 105. The Index also appears in the first issue each month and in addition, indexes for many items of equipment are published in the first issues of the months of January, April, July, and October.

Curve	Type of operation—	Basis	No. of plants or references
1	Cracking, catalytic, incl. gas plant, topping, feed preparation and poly unit*	Bbl. per day fresh feed	Over 100
2	Cracking, catalytic, incl. gas plant, feed preparation and alkylation unit*	Bbl. per day fresh feed	Over 100
3	Cracking, catalytic, incl. gas plant, feed preparation and poly unit*	Bbl. per day fresh feed	Over 100
4	Cracking, catalytic, incl. only gas plant*	Bbl. per day fresh feed	Over 100
5	Coking, delayed or fluid types	Bbl. per day fresh feed	Over 21
6	Cracking, thermal (also reforming)*‡	Bbl. per day fresh feed	Over 22
7	Natural-gasoline plants—85 per cent propane recovery†	M.M.s.c.f. per day	Over 55
8	Natural-gasoline plants—55 per cent propane recovery†	M.M.s.c.f. per day	Over 55
9	Gas-cycling plants—50 per cent propane recovery†	M.M.s.c.f. per day	Over 55
10	Gas-cycling plants—20 per cent propane recovery†	M.M.s.c.f. per day	Over 55

*See Cost-imating No. 27 of the April 1, 1957, issue, for cost of complete refineries. †Field plants, although the gas recovery plants in refineries cost somewhat the same as natural-gasoline plants (Curves 7 and 8). Patterned after Kilgren and Miller, The Oil and Gas Journal, April 27, 1953, p. 144. ‡Simple viscosity-breaking plants cost only about 60 per cent as much.



JOB IMPROVEMENT FOR THE PROCESS FOREMAN—85

Gas-Air Mixture Sets Furnace Efficiency

AIR supplying oxygen for combustion contains about 79 per cent nitrogen and impurities such as dust and moisture which contribute nothing to the reaction. A practical picture of actual furnace combustion of natural gas is this:

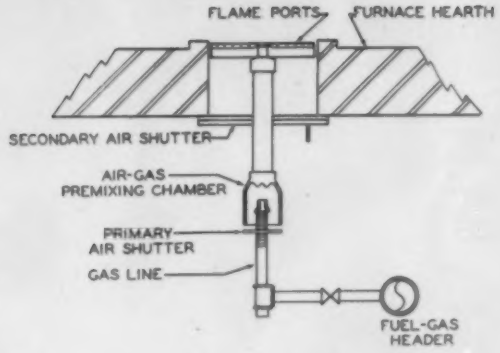
$CH_4 + {}^*O_2 + N_2 +$ impurities + moisture = $CO_2 + H_2O + N_2$ + impurities + moisture + heat + excess O_2.

The theoretical amount of air needed to burn 1 cu. ft. of gas is exactly enough to furnish oxygen for the above reaction without leaving the excess oxygen. This assumes that every particle of oxygen combines with the gas. For a known amount of gas, the exact amount of air required for complete combustion can be calculated. Ten cubic feet of air is the theoretical amount required to burn 1 cu. ft. of natural gas.

It is not possible to fire a furnace properly with the exact theoretical amount of air necessary for complete combustion of the gas. The millions of particles of oxygen pass through and by the burners so fast that some of them fail to bump into the carbon and hydrogen particles of the gas. Since the air that supports combustion is only 21 per cent oxygen and 79 per cent nitrogen, the nitrogen particles tend to crowd in between oxygen molecules and hydrocarbon molecules in much the same manner as a blocker in a football game. The hydrocarbon molecules that are not bumped by oxygen will not burn, but pass out the stack as flue gas and their value as a source of heat and energy will be wasted.

Excess air . . . For economical operation, it is important that all of the fuel gas be burned. Therefore, an excess amount of air is always admitted with the gas into a furnace to be sure that a molecule of oxygen is contacted with every available hydrocarbon molecule before it is lost through the stack.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.



PREMIX type of gas burner manufactured by John Zink Co., Tulsa. Fig. 11.

Now, the expression "excess air" can cover a lot of territory. How much "excess air?" In the answer to that lies the solution to most problems of furnace firing. There is no cut-and-dried answer, but experience, coupled with theory, has suggested the following means of determining the amount of excess air to use.

1. An operator of long experience on a specific furnace can tell approximately by looking into the firebox. This serves a purpose, but such experience can only be gained over a period of years of seeing furnaces fired in every manner—properly and improperly. It is not a reliable way to operate because of the different interpretation various operators place on visually observed conditions.

2. An automatic oxygen analyzer and recorder instrument will show the per cent of oxygen in the flue gas. By means of a chart this can be converted into a reading of the amount of excess air. Such an instrument is in operation at the Polyform unit.

3. The excess air in flue gas can be determined by an Orsat analysis by a tester engineer. This method is helpful in making periodic checks, but would be impractical in making routine furnace adjustments.

4. The operator can control excess air in the furnace by proper observation and interpretation of instruments used in furnace operation. These control points are transfer-line temperature; fuel-gas meter; firebox temperatures; and a draft gage connected to the firebox roof. An example of the application of these principles in furnace control is given: The proper amount of excess air is that amount which will hold the proper transfer-line temperature when the gas-meter chart reads the lowest for a given charge rate. With this in mind, the operator can close the stack damper a little and wait a few minutes. If a rising transfer-line temperature causes the fuel gas to be reduced it is apparent that combustion has been improved with the diminishing of excess air. At the same time, firebox temperatures should be watched to see that they do not exceed log-book orders and the draft gage watched for evidence of positive backpressure. If high firebox temperatures and positive pressure are caused by closing the damper, it should be opened gradually until these conditions are corrected.

Operating a furnace with too much air leads to the following undesirable conditions:

1. More heat is lost to the atmosphere in the extra oxygen, nitrogen, and moisture in the flue gas. Results of this are higher fuel consumption and higher flue-gas temperature.

2. Extra air causes more unbalance of temperatures inside the firebox. This causes hot spots from high currents of hot air and leads to burning and sealing of outside of furnace tubes.

One of the latest gas burners is made by John Zink Co. A cross-section view of this type burner in normal position in the furnace floor is shown in Fig. 11.

Confidentially....

here's why we buy our WELDED PIPE from J&L SUPPLY

A young fellow from J&L Supply came in today to see my Boss about an order for welded pipe. He got quite a razzing from the men in the outer office.

Jim wanted to know just what kind of a sales pitch any man could make on welded pipe. "It's all alike," Jim declared, cutting his eyes at the other fellows.

This chap from J&L just grinned. "I can give you two good grass-roots reasons for buying J&L welded pipe from us," he said. "We have well-balanced store stocks everywhere, and it doesn't take a carload customer to get us interested."

"I still say welded pipe is all alike," Jim shot back, eager for an argument.

Says the nice young fellow from J&L Supply: "I can only speak for our product. J&L makes every length of welded pipe as though it were going straight into critical service. Like our seamless, J&L welded pipe will handle any job it's designed to handle. In other words, you can depend on it whether it's butt-weld, lap-weld, or electric-weld."

Well, my Boss heard that and liked it — he's an engineer, you know, and rather meticulous. Says he to me later, looking very thoughtful: "I had to admit to the J&L Supply man that our records confirm what he said about J&L welded pipe. That's why he's going to get the order."

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L — A GREAT NAME IN STEEL

33-5-2

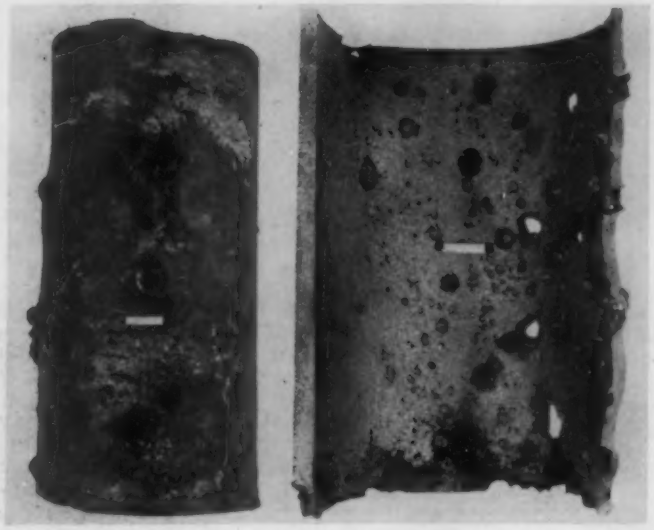
Part 6

REFINER'S NOTEBOOK

Corrosion of Ferrous-Metal Tubing

Corrosion by Sulfurous Constituents in Oils

by Thomas M. Krebs



PITTING AND BLISTERING of carbon-steel tube in cresylic acid recovery unit. Fig. 11.

PITTING ATTACK caused by local extreme oxidation at areas contaminated by zinc. Fig. 12.

AS mentioned earlier, corrosion by sulfurous constituents in oils is a common source of refinery corrosion at elevated temperatures and as in the case of oxidation has generally been quite successfully combated by the use of higher chromium materials.

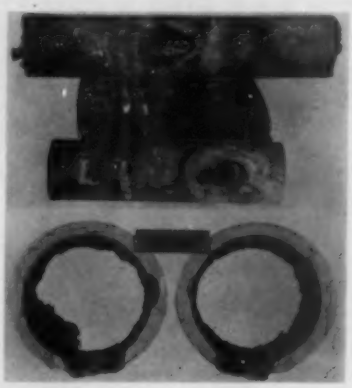
An unusual case was observed recently in cresylic acid recovery heater tubing in a Duo-Sol plant (Fig. 11). This carbon-steel tubing has served satisfactorily for about 8 years when a change was made to a more asphaltic crude. Increased coking resulted in increased firing rate with overheating. The tar contained about 5 per cent sulfur.

Bulges or blisters . . . Intergranular sulfidization occurred followed by attack possibly by cresylic acid. Pits formed and the hot wall was sufficiently weakened so that the force generated by coke depositing in the pits caused bulges or blisters.

Operating adjustments to reduce overheating and the use of Croloy 9M tubing which would be more resistant to sulfidization and oxidation were suggested to remedy the difficulty.

Various reactive chemicals like the low-melting metals or salts are capable of causing either general wastage or local attack of ferrous metals at elevated temperatures depending on circumstances. Fig. 12 shows a pit type of attack caused by zinc which somehow was deposited on a Type 347 tube used for superheating steam to about 1,350° F. for reaction with hydrocarbon.

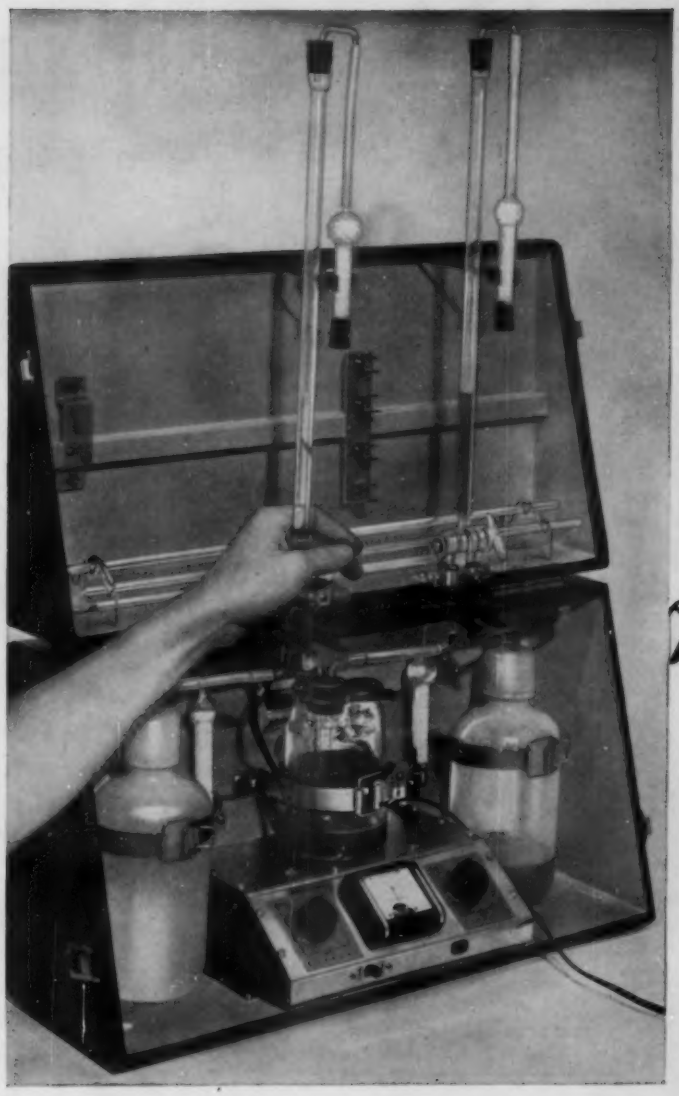
The zinc alloyed with the tube metal to produce a readily oxidizable alloy and severe local corrosion by oxidation occurred. When cold, the oxidized tubercles parted from the tube along brittle zinc-iron layers.



SEVERE PITTING corrosion in Type 304 catalyst regeneration kiln tubing caused by molten salts. Fig. 13.

As another case, Fig. 13 shows a pitting attack caused by molten salts in an 18-8 TCC catalyst regeneration kiln tube.

Author is metallurgist, Tubular Products Division, Babcock & Wilcox Co. Article presented at Western Petroleum Refiners Association meeting, Wichita.



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Sinclair Reports Its Best Year *To Date*

1956, by all principal standards, was the best year to date for Sinclair Oil Corporation and subsidiaries. New records were set in:

- **NET EARNINGS**
  Total $91,070,812, an increase of 12.8 per cent. This is exclusive of a non-recurring profit of $4,835,355.
- **CRUDE OIL PRODUCTION**
  Up for the seventh consecutive year as total liquid hydrocarbon output averaged 166,528 barrels daily, a 6 per cent rise.
- **REFINERY RUNS**
  Seven domestic refineries processed 437,319 barrels daily, a 5 per cent increase.
- **DOMESTIC SALES**
  Sales of principal products—gasoline, kerosene, fuel oils—were up 2 per cent in volume, 5 per cent in dollar value.
- **TRANSPORTATION VOLUME**
  Both pipe line and marine systems delivered record volumes and prepared for even greater quantities in the future.

The Company's crude oil production and reserves were fortified by an expanded program of exploration, production and acquisition. Significant new fields were found in Texas, Oklahoma, Offshore Louisiana and Venezuela, while the Company's position in the oil empire of western Canada was greatly strengthened.

A major research project will soon be launched with the opening of a new Radiation and Tracer Laboratory at the Company's research center, Harvey, Ill. Effects of powerful gamma ray radiation on petroleum products and processes will be investigated.

Details in Annual Report—Copy on Request

Sinclair *A Great Name in Oil*

SINCLAIR OIL CORPORATION · 600 FIFTH AVENUE. NEW YORK 20, N. Y

A 10-MINUTE JOURNAL FEATURE
Better Management

FUNCTIONS OF LEADERSHIP

Training people to do the job

Make effective use of workers

Efficient accomplishment of project

LEADERSHIP is a company's most important asset. Without it, a company soon reaches a stalemate between **what it has to work with** and **what it wants to accomplish.** Skilled workers flounder out of control, company know-how deteriorates into an easy jargon, and company production rides off in every direction. If leadership is available, however, a company can sail along with a willing cooperative work force; a feasible, practical production schedule; and a smoothly operating organization in general.

The function of leadership is—simply stated—to produce results. But the foremen, supervisors, department heads, and vice presidents—whoever the leaders of the company are—won't produce the results they should if they don't have some pretty clear ideas about good leadership. This must be in terms of today's increased knowledge about how human beings work. And, these principals must have some pretty clear ideas how they themselves measure up to the best sort of leadership standards.

Probably the big secret underlying all effective leadership is **self-knowledge.** It's obvious that a supervisor—or any other leader—must know where he's going and what he's going to do to get there if he is to be an effective leader of others. To be able to handle others, he must be able to handle himself. To understand others, he must understand himself. With a little self-knowledge, a good leader can make an effective effort in carrying out his company responsibilities—organizing, planning, directing, coordinating, and controlling. He'll see clearly the threefold nature of his job. These are: (1) training people to do the work, (2) handling the people who will do the work, (3) getting the work done.

You'll recognize that your most demanding job will be in "handling the people" and you'll soon realize that one of the best ways to handle people is to set a good example, to be a good employe yourself. You'll realize you too must give to the company the same cooperation and job enthusiasm that you attempt to get from the workers. You must be able to plan your own work, give your orders clearly, and provide training that appeals to the interests of the individuals working with you.

Along with this self-knowledge and realization, however, a good leader must meet some other obligations. First of all he must understand his company thoroughly, what the company is trying to do, and the part each department plays in accomplishing the total job. By studying and understanding company organization, a leader better understands the goals to be achieved, can better determine whether each employe contributes to the job, can determine whether too many or too few operations are performed to achieve desired results.

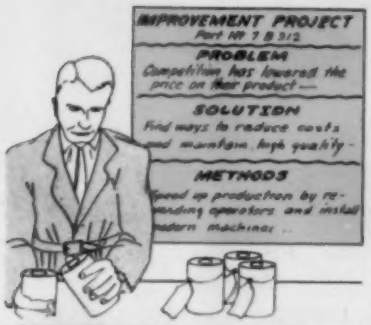
Another obligation of the good leader is to make an efficient and economical use of the resources available to him. Each supervisor must see to it that he uses all available assistance in doing the best job possible. He must learn to turn for assistance to his own boss, to staff conferences, to other supervisors—even to subordinates. In fact, a good leader should request advice from other departments, should develop informal contacts for information, and give full cooperation to other phases of company operation.

Finally, a good leader must see to it that his own department or work area gets its job done. And a good leader, knowing he can't do all the work himself, must judiciously delegate authority and responsibility to others —just as authority has been delegated to him. He must assume the obligation of placing some trust and faith in others, and being willing to take responsibility for the consequences.

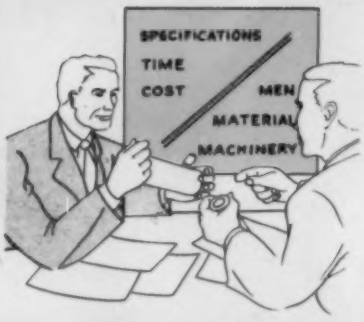
All in all, a good leader is a man with perspective and a sense of direction who, knowing himself, meets his employment obligations and strives to enforce the principles of cooperation, enthusiasm, and trust. He's the sort of man who builds an organization. He's the man who gets the job done the smoothest way possible and is able to report "mission accomplished"—in the least possible time at the least possible expense.

THE FUNCTIONS

PERFORMANCE REQUIREMENTS



Understand the company's problems



Establish standards for project

Help workers to maintain standards

ONE of the main responsibilities of a good leader is to set standards for company production and performance. As the leaders of a company go, so goes the company as a whole. If the leaders are satisfied with "something less than the best," most everyone else in the company will be, too.

Company standards most usually take the form of performance requirements: a mutual understanding between a supervisor and a worker as to what constitutes acceptable performance for each assigned task. **How good should it be, how much should be turned out, how long should it take.** With some sort of yardstick like this to measure production performance by, a supervisor is better able to know when work is properly completed, whose work is unacceptable, and who deserves training or commendation.

Standards are, of course, not always easily determined. But if a supervisor will approach the matter realistically and practically, he shouldn't have too much trouble. Frequently he makes the job harder for himself by overemphasizing operation details of the job rather than the results he wants to get. The simplest way to set a standard is to determine first of all what are the important aspects: Quantity of work? Quality of work? Time it takes to do the work? Then do a little research. Check past performance experience. Talk with as many workers doing the job as possible. Finally set a standard and give it a month's trial. A supervisor will probably come up with a good notion of what he can expect from a worker on any particular task.

Setting the standard is only the first step, however. After performance requirements have been determined they must be clearly communicated. Naturally, workers can't meet performance requirements only by guess. They must know what the company's counting on them to do. Whatever the requirement, it must be understood and accepted by all concerned.

Then, after performance requirements have been established, communicated, and agreed upon, the supervisor must begin to weigh the workers' performance continually against the requirement—and take whatever action is necessary and appropriate. Management can set up the loveliest standards in the world, everybody can agree to the standards, but if the standards are kept high on a shelf and never used they might as well not have been thought of in the first place. A supervisor—using company standards as a guide—should give recognition to workers exceeding requirements, help workers who are below standards, motivate workers whose work is acceptable to get them to perform better if they're capable. By using the standards set up, a supervisor creates a sound basis for estimating future work capacity; provides data for planning, organizing, and assigning work; determines who needs training and how much; provides a sound basis for personnel actions without waiting for formal ratings.

In determining, communicating, and making use of performance requirements, there are of course some obvious common sense rules to follow: (1) Standards should be impartial and not depend on the personal feelings of the supervisor, (2) standards should be applied to the supervisor's job as well as to the jobs he supervises, (3) samples—not every piece of work—should be checked according to standards, (4) observation and inspection must be impersonal, (5) the idea of standards must be "sold" to employes, (6) standards for departments are interdependent—a particular standard must be determined in relation to those set for work in related departments, (7) standards are only as good as company leadership wants them to be.

By doing his duty, as it were, in the field of performance requirements, a good leader can actually help lift a company up by its bootstraps. By establishing, maintaining, and improving performance requirements, and by getting those requirements across to the employes in general, a supervisor is exerting the sort of leadership that goes far in representing management to workers.

OF LEADERSHIP—1

CORRECT APPROACH

Promote worker satisfaction

Study and understand workers

Set good example for other workers

"YOU can lead a horse to water, but you can't make him drink"—that is, if you don't use the right approach. No matter how many performance requirements you set up or how logical your instructions are or just how plain right you are in making your decisions, you'll fail as a leader of people if you don't approach them in the right way. Workers aren't like machines. You can't just push a button and make them do what you want them to. Workers are people with ambitions that can be stirred, pride that can be hurt, nerves that can be shattered, hopes that can be realized.

About the only thing workers and machines do have in common is that they both need understanding if they're to work properly. A mechanic can't make an engine work right unless he has a thorough understanding of how it ticks. The same is true of people. Yet—many times supervisors act toward people in a way that indicates no understanding or concern about their desires or thoughts. Supervisors forget that people are their most precious commodity, even if viewed only from a cold production standpoint; all the machines in the world won't do the supervisor's job if he doesn't have people able and willing to keep those machines running. If no other reason than to get a willing, cooperative work force, company leaders ought to learn why people react as they do.

First of all, workers need recognition, opportunity, security, belonging. It has been adequately demonstrated by studies of worker groups that workers are more likely to be satisfied and productive if they receive recognition for their work, understand what is expected of them on the job, feel that they are accepted as members of the "team," and are given opportunities to grow and develop. The supervisor must learn to understand and recognize these basic needs in people. He must know his workers and their desires well enough to help them get job satisfaction. To do this the supervisor must make a continuing objective and orderly study of people to determine why they act as they do, and must develop friendly contact with and understanding of his employes.

Secondly, a good supervisor must realize that people differ one from the other—in attitude, ability, aptitude, interest, education, and the like. These differences must be taken into consideration by supervisors, for such differences have a bearing on assignments, potentials, worker stability, and they largely control a worker's action. Supervisors can't change emotional natures in workers, but through study of the individual and the situation they can learn how to help each worker adjust. Essentially, individuals differ mentally, emotionally, physically, and socially, and the supervisor has to work differently with each individual in establishing a good job atmosphere.

Of course, workers don't come to the supervisor and say, "I want recognition," or "I want security," or "I want to be a part of the group." And no worker wears a label telling how he differs from his colleagues. But by attitudes, emotions, actions, and reactions, employes reveal their basic urges and desires, and each employe reveals these motivations in his own peculiar way.

Whatever the approach he uses with any particular employe in any particular situation, a supervisor should base it on understanding and cooperation. Individualized supervision requires that a supervisor know each employe personally and requires that a supervisor give sincere thought to his employes so he can be a real leader and not just a roughshod boss that gets all his work done at the expense of those beneath him. A real leader gets more work done, but develops the worker in the process. And certainly for the supervisor—who takes pride in his leadership—there will be a certain personal satisfaction, beyond even the satisfaction of doing a good job for the company, as he broadens his horizons to include an appreciation of the "desires and differences," the psychological makeup, of his fellow men—and even of himself.

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Pipeline Patrol

. . . Report on Construction

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

U.S. Crude-Oil Pipelines

• **Cape Pipe Line Co.** (organized by Sun Oil Co., Cities Service Co., Atlantic Refining Co.)

Project: Long range plans for line on the lower Delaware Bay to the Philadelphia refining area.

Completion: 1960.

Four-Corners Pipe Line Co. (newly formed by Shell Oil Co., Standard Oil Co. of California, Continental Pipe Line Co., Gulf Oil Corp., Richfield Oil Corp., Superior Oil Co.)

Project: 600 miles of line from near Farmington, N. Mex., in the Four Corners area to Los Angeles, to be constructed and operated by Shell Pipe Line Corp. as agent for the companies.

Status: Under way.

Contractor: **San Juan Engineering Co.,** Farmington; **E. H. Schmidt & Associates, Inc.,** Tulsa; **McIntire & Quiros, Inc.,** Los Angeles.

Completion: End 1957.

Fulton, R. H. & Co., Lubbock, Tex.

Project: 39 miles of 6-in. from Donkey Creek field in northeastern Wyoming, southeast to the Osage pump station in Weston County.

Status: Fulton, a contractor has applied to Wyoming Public Service Commission.

• **Interstate Oil Pipe Line Co.**

Project: 5 miles of 4-in. from South Bosco field, Louisiana, to present main line, and 5 miles of various size from Church Point field, Louisiana, to present main line.

Status: Proposed.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)

Project 80 miles of 8-in. and 300 miles of 10-in. crude and products line from Four Corners area to Salt Lake City.

Status: To start May 1957.

Completion: August 1957.

• **Offshore Gathering Corp.,** Houston.

Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)

Status: Proposed.

Pasotex Pipe Line Co.

Project: 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: July 1, 1957.

• **Salt Lake Pipe Line Co.**

Project: 100 miles of 10-in. looping of Rangely, Colo., to Salt Lake City line.

Status: Pipe has been ordered.

Completion: Late 1957.

• **Shamrock Oil & Gas Corp.**

Project: 35 miles of 6-in. to serve fields in Ochiltree and Hansford counties in the Texas Panhandle.

Status: Plans to start building in March or April 1957.

Shell Oil Co.

Project: Undetermined length of 3, 4-in. in South Louisiana.

Status: Under way.

Contractor: **Brown & Root, Inc.,** W. P. Stanley, spread superintendent, office at Buras, La.

Completion: September 30, 1957.

• **Southern Kansas Pipeline, Inc.** (newly organized).

Project: 200 miles of 6 to 10-in. from southwestern Meade County to a point in Cowley County, 10 miles north of Arkansas City.

Status: Proposed. Request filed with Kansas Corporation Commission for permit.

• **Sinclair Pipeline Co.**

Project: 150 miles of 20-in. from **Teague, Tex., to Houston.**

Status: Planned for 1958.

Completion: 1958.

• **Tecumseh Pipe Line System** (Joint venture of Sinclair Pipe Line, Ashland Oil & Refining, and Pure Oil Co.)

Project: 190 miles of 20-in. between Griffith, Ind., and Cygnet, Ohio.

Status: To start May 1. Contracts to be let April 15.

Completion: September 1957.

Texas Co.

Project: 60 miles of 10-in. gathering lines at Aneth field in southeastern Utah.

Status: Under way.

Contractor: **Ted Price Construction Co.**

Completion: Late April 1957.

• **Texas-New Mexico Pipe Line Co.** (owned by The Texas Co., Sinclair Pipe Line Co., Tidewater Oil Co., and Empire Gas & Fuel Co.)

Project: 515 miles of 16-in. from southeast corner of Utah to Jal in southeastern New Mexico.

Status: Field surveys began January 1957.

U.S. Products Pipelines

• **Alaska-Yukon Refiners & Distributors, Ltd.**

Project: Two lines: one 150 miles from Haines to Haines Junction, Alaska, linking with government Canal line; another from Tok Junction, on the Canal line, to Anchorage.

Status: Proposed.

Completion: 1959.

• **American Pipe Line Co.**

Project: Line from Gulf Coast to New York City area. Received ODM approval to amortize 40 per cent of $175,000,000 cost with a rapid writeoff.

Status: Proposed.

Buckeye Pipe Line Co.

Project: Conversion of 116 miles of 8-in. crude to products between Huntington, Ind., and Griffith, Ind.

Status: Planned.

Contractor: **Sheehan Pipe Line Construction Co.,** C. M. Brown, superintendent, office at Rochester, Ind.

Completion: Fall 1957.

Project: Conversion of 32 miles of 8-in. crude to products between Mantua, Ohio, and Youngstown area.

Status: Planned.

Contractor: Company will do own work.

Completion: November 1957.

• **Cities Service Pipe Line Co.**

Project: 29 miles of 6-in. ethylene line from Lake Charles, La., to Orange, Tex.

Status: Planned.

Completion: July 31, 1957.

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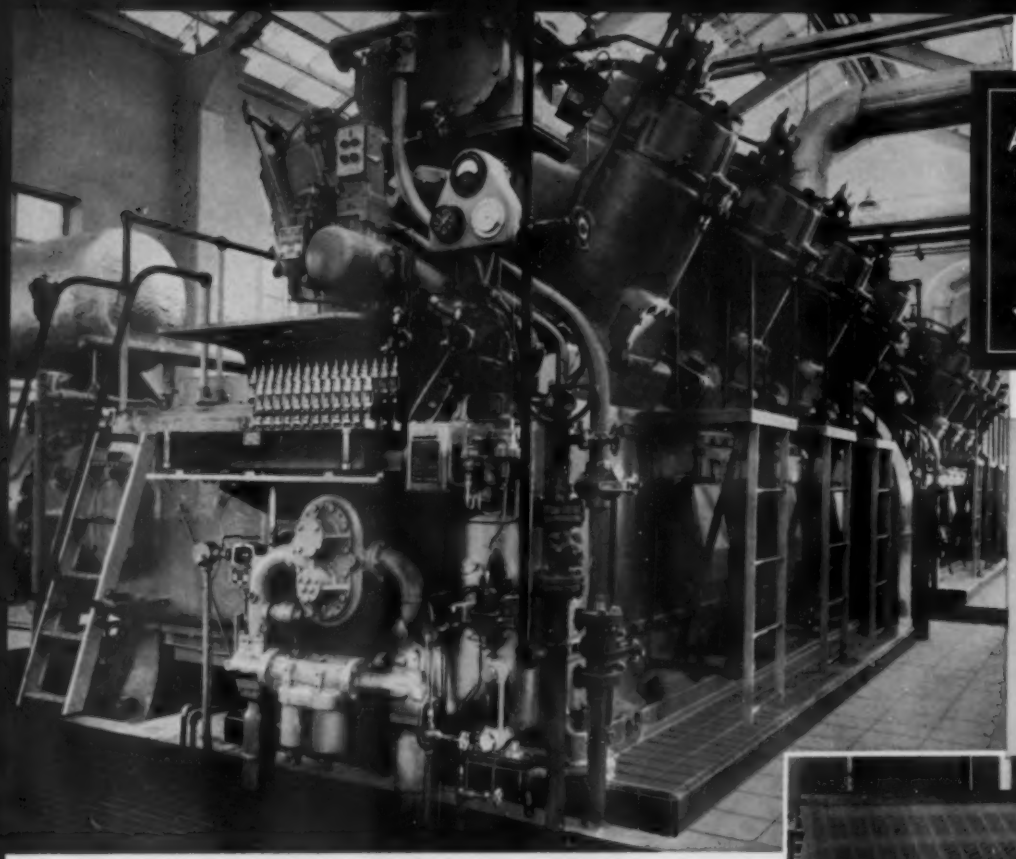
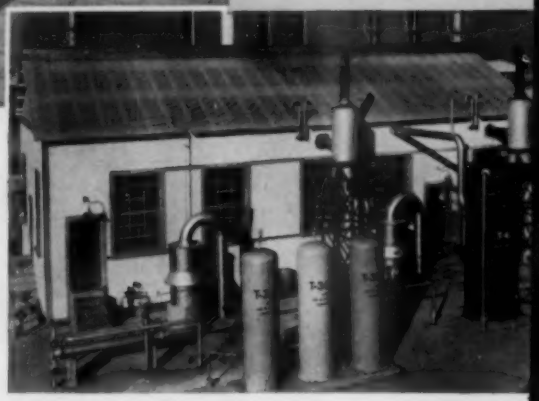


Another example of efficient compression at lower cost

Petroleos Mexicanos' Reynosa station, showing 8-cylinder Cooper-Bessemer V-angle compressors.

Exterior view of the neat, compact Reynosa gasoline plant.



COOPER-BESSEMER COMPRESSORS

FOR PETROLEOS MEXICANOS

. . . extreme dependability
. . . extremely economical

● The compression of natural gas and propane in Petroleos Mexicanos' gasoline plant, Reynosa, Tamps., Mexico, is a perfect example of extremes . . . all good!

Handling three pressure ranges, and handling them reliably and at low cost, is a brief summation of the Cooper-Bessemer performance story in this modern station.

Two 8-cylinder Cooper-Bessemer compressors handle plant process gas as well as compressing gas for distribution in northeast areas of Mexico and for export.

Known not only for performance . . . the name Cooper-Bessemer means cooperation and service all along the line. Detailed installation recommendations, experienced service engineers, availability and rapid delivery of spare parts from centrally located warehouses . . . each helps make your job easier, helps keep costs at a minimum. Find out for yourself, next time plans call for compressors up to 6,000 hp, check with Cooper-Bessemer.

ENGINES: GAS • DIESEL • GAS-DIESEL COMPRESSORS: RECIPROCATING AND CENTRIFUGAL, ENGINE OR MOTOR DRIVEN

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Branches in principal U.S. Cities, also: Edmonton and Calgary, Alberta • Halifax, N.S. • Caracas, Venezuela • Mexico City, Mex.

Pipeline Patrol

• **Continental Pipe Line Co.**
Project: Conversion of 99 miles of 6-in. from the Wichita Falls area to near Fort Worth, Tex., plus a 15-mile extension of the line to the Grapevine area northeast of Fort Worth.
Status: Conversion under way. Extension planned.

• **El Paso Natural Gas Co.**
Project: 11 miles of 4-in. L.P.G. products from Snyder Line to South Andrews Plant, Texas.
Status: Planned.
Project: 240 miles of 6-in. from Odessa to El. Paso, Tex.
Status: Planned.
Contractor: **Pipeline Engineering Co.** has design and engineering contract.
Completion: Early 1958.
Engineering Management, Inc.
Project: 58 miles of 10-in. from Richmond to Castle, Calif.
Status: Under way.
Contractor: **Hood Construction Co.**, William Burgess, spread superintendent, office at Sacramento.
Completion: July 1, 1957.

• **Great Lakes Pipe Line Co.**
Project: 84 miles of 8-in. from south of St. Paul to Eau Claire, Wis.; 68 miles of 12-in. from Great Lakes intersecting point with Badger Pipe Line to Chicago.
Status: Construction scheduled to start spring 1957.
Project: 15 miles of 6-in. from Lincoln, Neb., to Lincoln air base.
Project: 140 miles of 8-in. from Minneapolis to Superior terminals.
Project: 34 miles of 12-in. from Tulsa to Barnsdall, Okla., to supplement existing 12 and 8-in. lines.
Project: 14 miles of 8-in. from Coffeyville to Independence, Kan., to replace present 4-in line.
Project: 11 miles of 8-in. from approximately 10 miles east of the Great Lakes pumping station at Donahue, Iowa, to terminals on the Mississippi River at Bettendorf, Iowa.

• **Gulf Refining Co.**
Project: 530 miles of 10-in. L.P.G. and natural gasoline line from Waddell Plant in Crane County, Texas, to Mont Belvieu near Houston (368 miles is conversion from crude service).
Status: Under way.
Contractor: **Panama-Williams Corp.** has 46 miles from Waddell Plant to Midland. Remainder not let.

• **Laurel Pipeline Co.** (Gulf Refining Co. and Sinclair Pipe Line Co.)
Project: A 24-in. line from the Philadelphia refining area to Cleveland.
Status: Under consideration.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)
Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.
Status: To start May 1957.
Completion: August 1957.

• **Ohio Oil Co.**
Project: 350-miles of 12-in. from Wood River, Ill., to Chicago.
Status: Work to start fall 1957.
Completion: 1958.

• **Salt Lake Pipe Line Co.**
Project: 80 miles of 8-in. looping of line from Boise, Idaho, to Pasco Wash.
Status: Pipe has been ordered.
Completion: Late 1957.

• **Southern Pacific Pipe Lines, Inc.**
Project: 100 miles of 10-in., 80 miles of 8-in., and 125 miles of 6-in. between Richmond, Calif., and Fallon, Nev.
Status: Under way.

for safer connections join pipe

THE DRESSER WAY!

You'll find many piping jobs in and around oil terminals and refineries that can be simplified and speeded up with Dresser Couplings and Long Sleeves.

Particularly advantageous for tank and equipment installations, Dresser Couplings have a special "built-in" give and take that absorbs vibration, settlement and other stresses.

Perfect alignment of piping is unnecessary because a specially compounded rubber gasket permits up to 4° deflection at joints while guaranteeing bottle-tight connections.

Only a wrench is needed to make the connection. Threading is not required. Any workman can install Dresser Couplings, averaging two man-minutes per bolt.

AVAILABLE AT ALL LEADING OILFIELD SUPPLY STORES IN THE UNITED STATES AND CANADA

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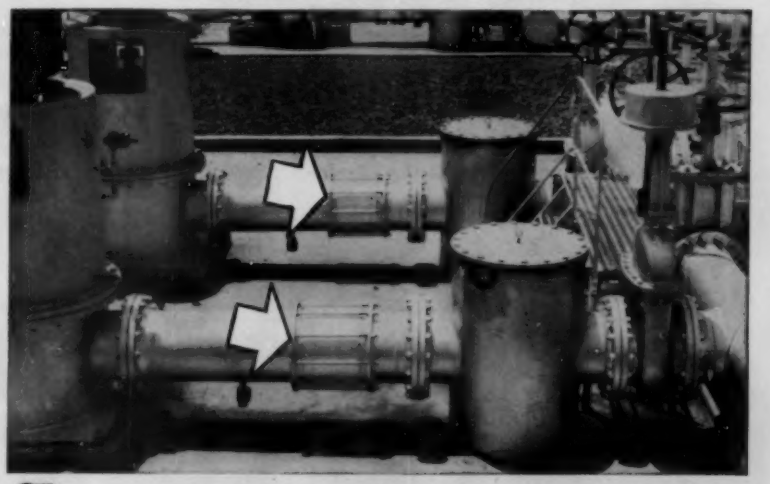
Dresser Manufacturing Division • Bradford, Pa.

ONE OF THE DRESSER INDUSTRIES

Dresser 10" Style 40 Long Sleeves on pump at oil terminal



Style 38 Coupling

Style 40 Long Sleeve

Hydropak® Asbestos Cement Pipe Clamp

Style 63 Expansion Joint

Style 39 Insulating Coupling

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You don't have to build and abandon expensive field camps anymore. You can keep your housing right with you, moving with your business . . . your employees will be happier with their families . . . and they can't be better accommodated than in SPARTAN mobile units.

SPARTANS are built for rugged use . . . riveted, all-aluminum construction . . . with the finest interior design and appointments for family living . . . practical comfort and convenience for field offices, kitchens, diners, bunk houses, and other custom units.

Some of America's greatest companies have turned to SPARTAN for the best in custom design for particular jobs. *

*Williams Brothers, internationally-known pipeline construction firm, will be using 57 SPARTAN mobile units for various field housing purposes on a pipeline job in Turkey.

SPARTAN IS THE ECONOMICAL ANSWER

SPARTAN
AIRCRAFT COMPANY
MOBILE HOMES DIVISION
1919 NORTH SHERIDAN ROAD
TULSA, OKLAHOMA

Pipeline Patrol

Contractor: **River Construction Corp.** has 84 miles of 8, 10-in. from Richmond to Stockton, Calif. to complete late spring 1957, F. O. Traweek, spread superintendent, office at Richmond. **Hood Construction Co.**, Lynwood, Calif., has 58 miles of 10-in. from Stockton to Roseville, Calif. **Engineers, Limited Pipeline Co.** and **Joe E. Young Pipe Line Construction Co.** have 18 miles of 6 and 8-in. between Roseville and Donner Summit.

Completion: August 1, 1957.

- **Union Oil Co. of California**

Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.

Status: Proposed.

U.S. Natural-Gas Pipelines

- **American Louisiana Pipe Line Co.**

Project: 7 miles of 16-in. and 5 miles of 12-in. at North Holly Beach Field and Second Bayou Field, Cameron Parish, La.

Status: Has temporary FPC permit.

- **Arkansas Louisiana Gas Co.**

Project: A 300-mile line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system, plus gathering lines.

Status: Long-range plans.

Carolina Pipeline Co.

Project: 177 miles of 2, 3, 4, 6, 8, and 10-in. between Blacksburg and Camden. S. C.

Status: Work to start June 1, 1957.

Contractor: **Panama-Williams Corp.**

- **Central Hudson Gas & Electric Corp.**

Project: 46 miles of 10-in. from Albany to Kingston, N. Y.

Status: Planned.

Completion: November 1, 1957.

Cities Service Gas Co.

Project: 8 miles of 16-in., 20 miles of 8-in., 20 miles of 6-in., and 20 miles of 4-in. field lines in Barber County, Kansas.

Status: Approved. Under way.

Contractor: **Vaughn & Taylor Construction Co.**

Project: 3 miles of 12-in., 8 miles of 10-in., 4 miles of 8-in., 8 miles of 6-in., and 37 miles of 4-in. field lines in Eureka Field, Okla.

Status: Approved. Under way.

Contractor: **Vaughn & Taylor Construction Co.**

Project: 4 miles of 16-in. at Sarcoxie, Mo.

Status: Approved. Under way.

Contractor: **Prairie Construction Co.**

Project. 64 miles of 6 to 30-in. in Leavenworth and Anderson counties, Kansas, Cass County, Missouri. and Oklahoma County, Oklahoma.

Status: Planned.

- **Coastal Transmission Corp.**

Project: 575 miles of 12, 20, 22, 24-in. main line and 414 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.

Status: Has FPC approval.

Completion: January 1, 1958.

- **Colonial Natural Gas Corp.**

Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.

Status: Proposed.

- **Colorado Interstate Gas Co.**

Project: 1957 program . . . 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping.

Status: Pending FPC approval.

Project: 139 miles of 4 to 24-in. from Mocane to Hooker, Okla.

Status: Under way.

STREAMLINED WATERFLOODING...

with Win Well 7-WAY MULTI-PORT ROTARY SELECTOR VALVE

7 WELLS (or less) CAN BE FLOODED FROM ONE CENTRAL SOURCE!

Low-cost water distribution to several wells at once . . . application of specific volumes and pressures to different wells . . the ability to determine the productivity of any of the wells involved . . . these are the revolutionary advantages in applying the new Win-Well Multi-port Rotary Selector Valve to waterflooding systems.

The simplicity of Win-Well's design, and the field-tested adaptability of the Win-Well Valve to other manifolding systems offers great advantages to multi-well operators. Detailed explanations of Win-Well's uses are yours upon request.

- Simplifies METERING TESTING SAMPLING GATHERING MANIFOLDING TANK-SWITCHING
- Cuts Costs on expensive Multi-well systems
- No Corrosion Worries
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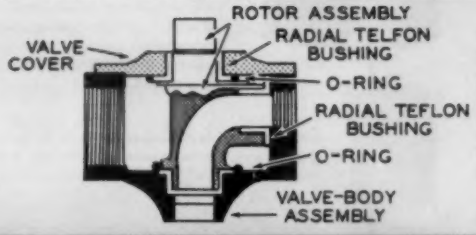
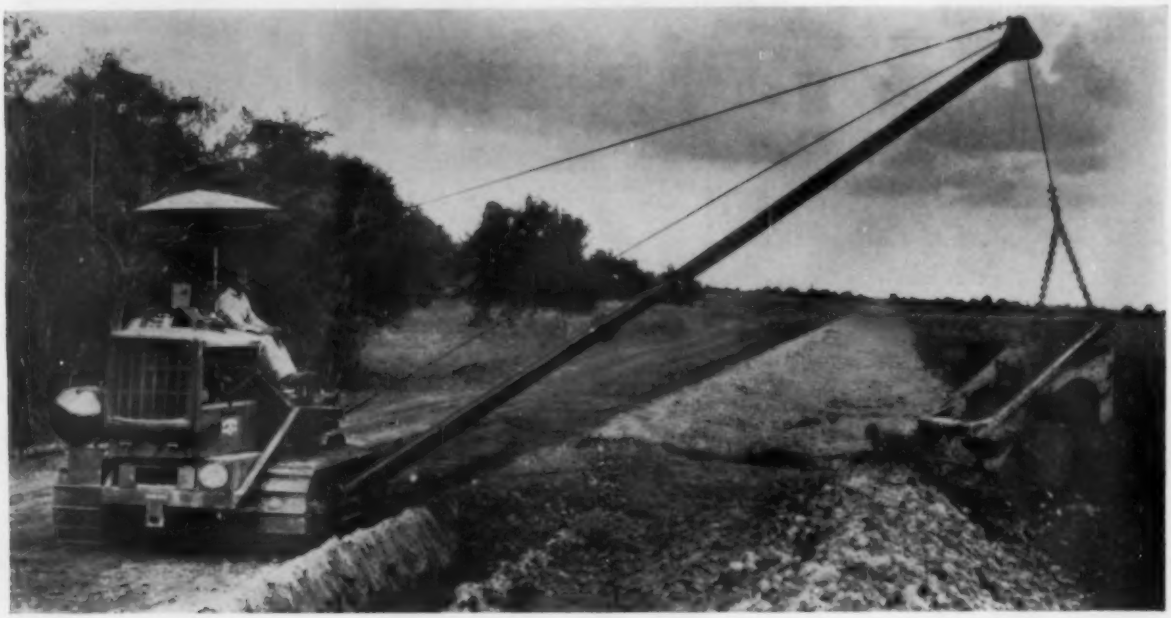
for MANUAL OPERATION or AUTOMATION

Sales-Service Representatives for Consultation —IMMEDIATELY! Wire, call, or write—



Win Well Manufacturing Company
8460 West Third St. Los Angeles 48, Calif.



WORKING ON THE HEELS OF THE LOWER-IN CREW a one-man-operated Cleveland 190 helped to keep this United Gas pipeline job moving along, leaving no open trench at the end of any day's work. A report from Fowler-Tatom Pipeline Contractors states, "The Cleveland 190 backfilled trench almost as fast as a man can walk." Where trenches were water-filled the 190 tied down pipe then doubled back to complete the fill and finished it off with a neat clean-up job. Much of the 16-mile line from the Chocolate Bayou field to the main line near Webster, Texas, cuts through rice-growing farmlands, so the 190 had to pull down big heavy spoil banks of wet sticky gumbo much of the way.

THE CLEVELAND TRENCHER COMPANY, 20100 St. Clair Avenue, Cleveland 17, Ohio

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insist on the highest quality

Gotkool

water cans and coolers

Specify **"GOTKOOL"** *the next time you order water cans or coolers.* **"GOTKOOL'S"** exclusive construction keeps water cooler . . . fresher . . . purer. Extra wide, snug-fitting, splash-proof top keeps out impurities. Non-leaking, push-button faucets, either extended or recessed flush-mounted. *Buy* **"GOTKOOL"** *at your supply store today.*

GOTKOOL Water Cooler – made in 1½-, 2-, 3-, 5-, 10-, 15-, and 20-gallon sizes with either extended or recessed, flush-mounted faucet. *Note:* 15- and 20-gallon sizes available with extended faucet only.

GOTKOOL Water Can – made in 1½-, 2-, 3-, 5-, 10-, 15-, and 20-gallon sizes without faucet.

Insist on the genuine – look for the Blue and Black Label with the name "GOTKOOL" in Red.

H. P. GOTT MFG. CO.

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the new Fabulous Fourteenth floor—sumptuous one-of-a-kind rooms and suites for VIP's and truly discriminating guests!

the famed Top O' the Columbus —gourmet food; cocktails; supper dancing; panoramic views of ocean, bay, and city!

the convenient headquarters for your stay—downtown airlines terminal; near smart shops, theatres, and office buildings!

Completely air-conditioned

THE Columbus HOTEL

Biscayne Blvd. at First St.
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Pipeline Patrol

Contractor: **Panama, Inc.** Spread offices will be at Beaver City and at Mocane, Okla.
Completion: May 15, 1957.

• **Eastern Shore Natural Gas Co.**
Project: 34 miles of 8-in. and 90 miles of 6-in. from connection with Transcontinental Gas Pipe Line Corp. in Maryland, across entire length of Delaware to Salisbury.
Status: Pending FPC approval.

• **El Paso Natural Gas Co.**
Project: 338 miles of 34-in. from San Juan and Permian basins to California border.
Status: Under way.
Contractor: **R. H. Fulton Co.** has 102 miles; **Western Pipeline, Inc.,** has 144 miles; El Paso will construct remaining 92 miles.
Completion: April 1957.
Project: 74 miles of 34-in. San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: August 1957.
Project: 81 miles of 18-in. from Panoma Plant, Gray County, to Dumas Plant, Moore County, Texas.
Status: Planned. Filed for FPC permit.
Completion: July 1957.
Project: 177 miles of 20-in. from Sonora Plant, Sutton County, to Plains Plant, Yoakum County, Texas.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 74 miles of 30-in. Permian-San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 216 miles of 6 to 34-in. in Arizona, Texas, and New Mexico, plus 533 miles of various size line.
Status: Filed for FPC permit.

Fish Service & Management
Project: 300 miles of 2 to 10-in. distribution lines at Boise, Idaho.
Status: Under way.
Contractor: **Hood Construction Co.,** C. R. Shearman, spread superintendent, office at Boise.
Completion: April 30, 1957.

Houston Texas Gas & Oil Corp.
Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 240 miles of 18-in. from Kissimmee to Cutler, Fla.; 642 miles of 3 to 18-in. sales laterals in Florida. Main line to join Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.
Status: Planned. FPC certificated.
Contractor: **Midwestern Constructors** has the 702 miles of 24-in.; **Harbert Construction Corp.** has remainder.
Completion: June 1958.

• **Iron Ranges Natural Gas Co., St. Paul.**
Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.
Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co.**
Project: 61 miles of various size gathering line in Camerick field, Texas County, Oklahoma.
Status: Approved.
Project: 10 miles of 10-in. between Grand Island and Fullerton, Nebr.
Status: Approved.
Completion: May 1, 1957.
Project: 12 miles of 12-in. between Scott City and Colby, Kans.
Status: Approved.
Completion: May 1, 1957.

Michigan Consolidated Gas Co.
Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.;** Floyd Huduall, spread superintendent, office at Cadillac, Mich.

CROSE . . . LINE TRAVELING
COATING & WRAPPING MACHINES
THE FINEST ON THE LINE BECAUSE OF IT'S SPRAY-RING APPLICATOR

Uniform Coating Precision Wrapping
Coats Bends or "Egged" Pipe

More contractors use CROSE machines because they have all the features required for most trouble-free, highest quality performance. Available in sizes that handle pipe 2" to 36".

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Pipeline Patrol

Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.**, jointly with **J. L. Gentry Construction**; **Frank Morris**, spread superintendent, office at Hart, Mich.

• **Michigan Wisconsin Pipe Line Co.**
Project: 24 miles of 24-in. and 18 miles of various size looping in Michigan, Indiana, Illinois, Wisconsin, Iowa, and Missouri.
Status: Approved.
Completion: October 1, 1957.

• **Midwestern Gas Transmission Co.**
Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin.
Status: Application pending with FPC.

• **Mississippi River Fuel Corp.**
Project: 125 miles of loops along portions of present lines from fields in Louisiana and eastern Texas, to St. Louis.
Status: Planned.

• **Mountain Fuel Supply Co., Salt Lake City.**
Project: 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.
Status: Has temporary FPC permit.

• **Natural Gas Pipeline Co. of America**
Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex.
Status: Under way.
Contractor: **R. H. Fulton & Co.** has Red River crossing in northern Montague County.
Completion: Total project to be completed by January 1, 1958.
Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and for 91 miles of 30-in. loops along parts of its main line.
Status: Application pending with FPC.

• **New York State Natural Gas Corp.**
Project: 15 miles of 30-in. from Horseheads to Newfield, N. Y.; 31 miles of 20-in. from Harrison to Woodhull, N. Y.; 10 miles of 12-in. from Stockbridge to Oneida, N. Y.
Status: Planned.

• **Niagara Mohawk Power Corp.**
Project: 14 miles of 18-in. from Phoenix to Palermo, N. Y.
Status: Planned.
Completion: October 1, 1957.
Project: 261 miles of 2 to 16-in. transmission and distribution mains to service areas in central, eastern and northern New York state.
Status: Planned.
Contractor: Various.
Completion: December 31, 1957.

• **North Carolina Natural Gas Corp. (Subsidary of Colonial Natural Gas Corp.)**
Project: 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across north Carolina.
Status: Has FPC permit.

• **Northern Natural Gas Co.**
Project: 160 miles of 2, 3, 6, 8-in. branch lines to serve 20 new communities on Aberdeen, S. D., line.
Status: Under way.
Contractor: **Troth Construction Co.**
Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.
Status: Planned.

• **Offshore Gathering Corp.**, Houston.
Project: 364 miles in Gulf of Mexico off Louisiana.; 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)
Status: Application pending with FPC.

• **Ohio Fuel Gas Co.**
Project: 7 miles of 12-in. near Fremont, Ohio.
Status: Planned.
Completion: First half 1957.
Project: 23 miles of 18, 20-in. from Gibsonburg to Toledo.
Status: Uncertain.
Project: 152 miles of line in Ohio: 38 miles of 24-in. from Crawford Station to Utica; 18 miles of 24-in. from Pavonia Station to Line D; 6 miles of 20-in. from Mount Gilead to Claridon; 4 miles of 20-in. near Dayton; 4 miles of 20-in. near South Charleston; 7 miles of 16-in. near Springfield; 6 miles of 20-in. nnear Oberlin; 17 miles of 20-in. from Oak Hill to Symmes Station; 7 miles of 12-in. from Mount Sterling to Bloomingburg; 2 miles of 8-in. near Bellefontaine; 3 miles of 12-in. near Mansfield; 4 miles of 12-in. near Lakeville; 7 miles of 8-in. in Guernsey and Belmont counties.
Status: Planned.
Completion: Second half 1957.

• **Pacific Gas & Electric Co.**
Project: 37 miles of 20-in., 37 miles of 18-in., 3 miles of 16-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**
Completion: June 1957.
Project: 138 miles of 34-in. looping of the Topock-Milpitas line.
Status: Planned.
Completion: December 1, 1957.
Project: 5 miles of 16-in., 160 miles of 12-in., 8 miles of 6-in. from Corning to Eureka, Calif., to connect company's Hum-

for Compressed Air and Gas Drainage

ARMSTRONG *Snap-Action* TRAPS

Assure Wide Open—Tight Shut Operation

No. 71-315 forged steel Armstrong "Snap-action" Traps draining water from natural gas scrubber.

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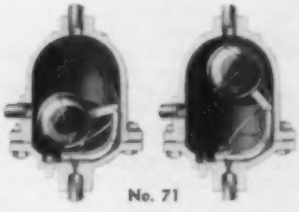
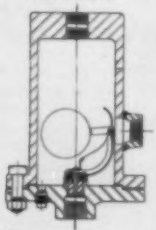


No. 71

Spring holds valve tight until float buoyancy overcomes spring pressure. Then spring snaps up, opening valve wide. Before all water leaves trap, valve snaps closed.

FORGED STEEL No. 71-315



For pressures to 1000 lbs. Same mechanism as No. 71.

Positive action, no dribbling, no hunting, no gas or air loss—these are the advantages of the Armstrong "Snap-action" ball float trap with spring-powered valve. The valve is always water-sealed. Fine dirt and grit won't interfere with operation.

Don't worry about maintenance. The flat strip spring of special Swedish steel lasts for years in ordinary service. Valve and seat are hardened chrome steel. All other internal parts are stainless steel. Special materials are available for special corrosion problems.

Like all Armstrong products, these traps are *unconditionally guaranteed* to satisfy. Call your local Armstrong Representative, or write Armstrong Machine Works, 8685 Maple St., Three Rivers, Mich.

How to Select TRAPS

Free Bulletin 289 gives complete selection data on ball float traps for draining water and *light liquids*. Ask for your copy. No obligation.

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ROBERT F. CASHEN — Manager Petroleum Department

For Cathodic Protection.. only ZINC ANODES

Have Long Life and are Self-Regulating

Unlike other metals sometimes used for cathodic protection, zinc anodes have an expected life of a minimum of fifteen years. Zinc anodes are self-regulating and require no current regulating resistors to meet the load demand, whether high or low.

These are important reasons why American Zinc Anodes are first choice for cathodic protection in the oil and gas industry. Your inquiries invited.

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HOUSTON, TEXAS • TULSA, OKLA. • NEW ORLEANS, LA.
CORPUS CHRISTI, TEXAS • DENVER, COLO.

Pipeline Patrol

boldt Division with integrated gas system.
Status: Planned.
Completion: January 1958.
Project: 13 miles of 12-in., 2 miles of 10-in., from Santa Cruz to Davenport, Calif.
Status: Planned.
Completion: October 1957.

• **Pacific Northwest Pipeline Corp.**
Project: 37 miles of 6-in. from Dove Creek to Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America.
Status: Has FPC permit.
Project: 1,000 miles of gathering lines and laterals along present line.
Status: Planned.
Completion: 1957.

• **Pennsylvania Gas Co.**
Project: 23 miles of 10-in. in Erie County, Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pennsylvania, 30 miles of branch lines and a number of small distribution systems.
Status: Has FPC permit.

• **Peoples Natural Gas Co.**
Project: 58 miles of 2 to 14-in. extension and replacement lines in Pennsylvania.
Status: Work to start April 1957.
Completion: September 1957.

• **Permian Basin Pipeline Co.**
Project: 83 miles of 16-in. from its Spraberry station in Midland County, Texas, to tie in with Pioneer Gathering System, Inc., at a point in northwestern Schleicher County, Texas.
Status: Filed for FPC approval.

• **Phillips Petroleum Co.**
Project: 6 miles of 16-in. in Gray County, Texas.
Status: Under way.
Contractor: **Arey Construction Co.**
Completion: May 1, 1957.
Project: 3 miles of 24-in. in Moore County, Texas.
Status: Planned.
Completion: October 1, 1957.
Project: 30 miles of 3 to 8-in. in Moore, Hutchinson, Sherman, Hansford, and Gray counties, Texas, and in Texas County, Oklahoma.
Status: Planned.
Contractor: Various.
Completion: January 1, 1958.

• **Piedmont Gas Co.**, Hickory, N. C. (Parent is Carolina Natural Gas Corp.)
Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.
Status: Application pending with FPC.

• **Pioneer Gathering System, Inc.**
Project: 27 miles of 16-in. and 27 miles of 12-in. in Schleicher and Sutton counties, Texas.
Status: Filed for FPC approval.
Completion: July or August 1957.

Southern California Gas Co. and Southern Counties Gas Co. of California.
Project: 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Completion: June 30, 1957.
Project: 4 miles of 30-in. from Los Angeles River to Victoria Station at Los Angeles.
Status: Planned.
Completion: July 30, 1957.

• **Southern Natural Gas Co.**
Project: 10 miles of 8-in. laterals in Napoleonville Field and Fort Jackson Field, La.
Status: Has FPC approval.
Completion: December 1, 1957.
Project: 32 miles of 6-in. from Chandeleur Sound area, Breton Island, La.; 7 miles of 8-in. and 5 miles of 10-in. from Main Pass area to Olga, La.; 9 miles of 8-in. from Bastian Bay Field to Fort Jackson Field; 7 miles of 8-in. laterals in Manila Village Field.
Status: Plan to apply for FPC permit.
Completion: December 1, 1957.

Spokane Natural Gas Co.
Project: 400 miles of 1 through 24-in. distribution system at Spokane.
Status: Under way.
Contractor: **Hallmac Construction Co.**; V. L. Williams, spread superintendent, office at Spokane.
Completion: 1957.

• **Tennessee Gas Transmission Co.**
Project: 221 miles of 30-in., 101 miles of 26-in., and 10 miles of 24-in. looping from Portland, Tenn., to Greenup, Ky.; from Morehead, Ky., to Catlettsburg, Ky.; from Catlettsburg to Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from New Castle, Pa., to near Pittsburgh, Pa.
Status: Pending FPC approval.
Project: 51 miles of 26-in., 51 miles of 20-in., and 17 miles of 12-in. gathering lines from Kinder, La., to offshore fields in Gulf of Mexico.
Status: Pending FPC approval.
Project: 577 miles of 30-in. from Mississippi River delta area south of New Orleans to Portland, Tenn.
Status: Pending FPC approval.
Project: 76 miles of 24-in. between Coudersport, Pa., and Hamburg, N. Y.
Status: Pending FPC approval.

• **Texas Eastern Transmission Co.**
Project: 422 miles of 30-in. from near McAllen to Beaumont, Tex., to move imported Mexican gas; 45 miles of 24-in. laterals from McAllen to Provident City, Tex., 77 miles

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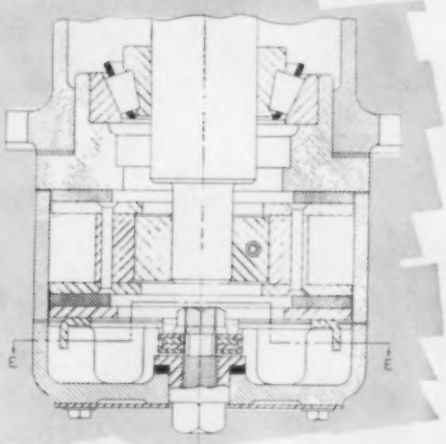

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Pipeline Patrol

of 30-in. looping between Kosciusko, Miss., and Uniontown, Pa.; 147 miles of supply and sales laterals.

Status: Under way.

Contractor: **Houston Contracting Co.** has 121 miles of 30-in. between Angleton and Vidor, Tex. **H. C. Price Co.** has 70 miles of 30-in. **H. B. Zachry Co.** has 201 miles of 30-in. starting near McAllen and running northeast to near Angleton, Tex. **Grayco Constructors, Inc.** has 45 miles of 24-in. laterals from Blessing to Provident City. **Western Pipe Line, Inc.,** Austin, has 30-in. crossings at Nueces, Lavaca, and Carancahua bays. **Missouri Valley Dredging Co.,** Omaha, has crossings at Hinds and Guadalupe bays. **Altgelt Construction Co., Inc.,** has 100 miles of 3, 4, 6, 8-in. gathering lines in the Corpus Christi area.

Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.

Status: Has FPC approval.

Project: 97 miles of 30-in. loops between Kosciusko, Miss., and Uniontown, Pa., and 40 miles of new lateral supply lines.

Status: Filed for FPC permit March 15. 1957.

Completion: September 1, 1957.

• **Texas Illinois Natural Gas Pipeline Co.**

Project: 10 miles of 36-in. to loop existing single 30-in. near Joliet, Ill.

Status: Has FPC approval.

• **Transcontinental Gas Pipe Line Corp.**

Project: 172 miles of 36-in., 68 miles of 30-in., 162 miles of 24-in., and 64 miles of smaller diameter pipe to loop main line from Texas to New Jersey.

Status: Work in North Carolina to start late May 1957.

Contractor: **Western Construction Co.** has 65 miles of 36-in. and 45 miles of 30-in. at scattered spots along the system in South Carolina, North Carolina, Pennsylvania, and Virginia. Western will start work in North Carolina, spread office at Winston-Salem.

Completion: Total project to be completed December 1957.

• **United Gas Pipe Line Co.**

Project: 40 miles of 8-in. from Baldwin County, Alabama, to Container Corp.'s plant.

Status: Has FPC permit.

Canadian Crude-Oil Pipelines

• **B-A Alberta Pipe Line, Ltd.**

Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.

Status: Pending approval.

Interprovincial Pipe Line Co.

Project: 156 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.

Status: To start May 1957.

Contractor: **Somerville Construction Co.** has 90 miles; **Majestic Contractors, Ltd.,** has 66 miles.

Completion: September 1, 1957.

Project: 33 miles of 24-in. from Kendal to Peebles, Sask.

Status: To start June 1, 1957.

Contractor: **Fulton Banister, Ltd.,** John O'Rourke, superintendent.

Completion: July 31, 1957.

Project: 79 miles of 26-in. from Clearbrook, Minn., to Superior, Wis.

Status: To start June 1, 1957.

Contractor: **R. H. Fulton & Co.**

Completion: August 31, 1957.

Pembina Pipe Line, Ltd.

Project: 100 miles of 3 to 12-in. gathering line in Pembina oil field.

Contractor: **Universal Pipe Line, Ltd.,** subsidiary of Mannix, Ltd., T. Childress, spread superintendent, office at Drayton Valley, Alta.

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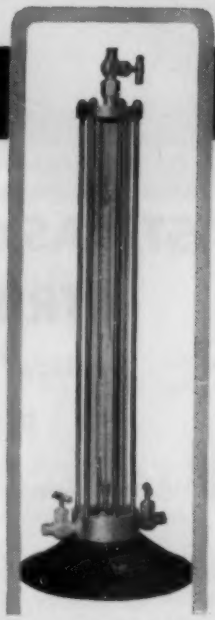

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Pipeline Patrol

Completion: November 1, 1957.
Project: 32 miles of 16-in. from Calmar to Edmonton, Alta.
Status: Under way.
Contractor: **Universal Pipe Lines, Ltd.**, subsidiary of Mannix, Ltd., Otis Hare, spread superintendent, office at Calgary, Alta.
Completion: July 1, 1957.

Rangeland Pipe Line Co.
Project: 48 miles of 12-in. between Sundre and the Sylvan Lake in south-central Alberta.
Status: Under way.
Contractor: **Dutton-Williams Brothers, Ltd.**
Completion: August 1957.

• **Royalite Oil Co., Ltd.**
Project: 250 miles of line to move oil from the Athabasca oil sands of northeastern Alberta to Edmonton.
Status: Long range plans.
Completion: 1960.

• **Trans Mountain Oil Pipe Line Co.**
Project: 100 miles of 30-in. loops: 50 miles east of Kamloops, B. C., and 50 miles west of Edson, Alta.
Status: Under way.
Contractor: **Marine Pipeline & Dredging, Ltd.**, has Thompson River crossing, B. C., J. H. McCartney, spread superintendent, office at Kamloops, B. C. **R. A. Conyes Construction Co.** has the 50 miles east of Kamloops; **Dutton-Williams Brothers, Ltd.** has the other 50 miles.
Completion: River crossing will be done by June 15, 1957; remainder by July 31, 1957.

• **Westspur Pipe Line Co.**
Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.
Status: Planned. Has requested permit from Board of Transport Commissioners.
Project: 75 miles of 16-in. from Steelman, Sask., to Cramer, Man., Canada.
Status: Work starts May 1957.
Completion: July 30, 1957.

Canadian Products Pipelines

Hydrocarbons Pipeline Co. (Subsidiary of Canadian Hydrocarbons)
Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.
Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957.
Construction consultants: **Dutton-Williams Brothers, Ltd.**, Calgary, and **A. D. Little & Co.**, Boston.

Imperial Oil, Ltd.
Project: 37 miles of 12-in. from Waterdown to North Toronto, Ont.
Status: Under way.
Contractor: **Majestic Contractors, Ltd.**, Otis Hare, spread superintendent, office at Cooksville, Ont.

Canadian Gas Pipelines

• **Alberta Gas Trunk Line Co., Ltd.**
Project: 637 miles of 34 to 16-in. gathering lines in Alberta.
Contractor: **Dutton-Williams Brothers, Ltd.**, has preliminary studies, design and management-engineering. **Universal Pipe Line, Ltd.**, subsidiary of Mannix, Ltd., jointly with **Marine Pipeline & Dredging Co.**, has crossing of Red Deer River near Cavendish, Alta., J. Hysuick, spread superintendent, office at Empress.
Status: River crossing completed. Total project to be completed in 1960.

Inland Natural Gas Co., Ltd.
Project: 304 miles of mainline and 25 miles of laterals from Savona to Nelson, B. C.: 150 miles of 12-in.; 112 miles of 10-in.; 67 miles of 6-in. Also will build 400 miles of distribution piping in 31 towns.
Status: Under way.
Contractor: **Dutton-Williams Brothers, Ltd.**; Pat Campbell, project manager, office at Penticton.
Completion: October 1, 1957.

Plains-Western Gas & Electric
Project: 16 miles of 10-in. from the Trans-Canada Pipe Line to Brandon, Manitoba.
Contractor: **Banister Construction, Ltd.**, George Caron, superintendent.
Completion: 1957.

Saskatchewan Power Corp.
Project: 13 miles of 4-in. lateral to town of Kerrobert, and 10 miles of 6-in. lateral to Kindersley Power Plant, Sask.
Status: Planned.
Contractor: **Banister Construction, Ltd.**
Completion: July 15, 1957.
Project: 300 miles of 1 to 20-in. distribution lines at Regina, Sask.
Status: Planned.
Contractor: **S. E. Construction (Alberta), Ltd.**, and **Pacific Pipeline Construction Alberta), Ltd.**, jointly.

• **Trans-Canada Pipe Lines, Ltd.**
Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. (First part of 2,250-mile line from Alberta to Toronto and Montreal.)
Status: Under way.
Contractors: **Majestic Contractors, Ltd.** (104 miles from Burstall to Stewart Valley, Sask., R. L. Leonard, spread supt., office at Cabri.; **Canadian Bechtel, Ltd.** (110 miles from Swift Current to Moose Jaw, Sask., J. L. Work, general supt., office at Moose Jaw, and 54

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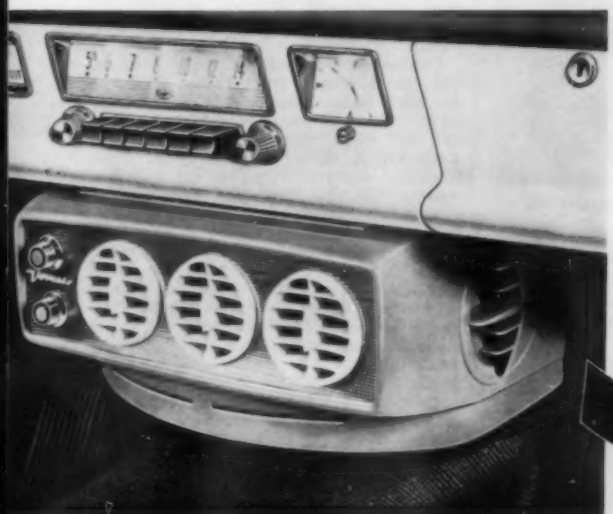

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Pipeline Patrol

miles from Portage la Prairie to Winnipeg); **Universal Pipe Line, Ltd.,** subsidiary of **Mannix, Ltd.,** (90 miles from Moose Jaw to Welseley, spread superintendent, Otis Hare, office at Regina, Saskatchewan); **Dutton-Williams Brothers, Ltd.** (97 miles from Deveren to Moosomin, under way, to complete August 1957). **Price-Poole of Canada, Ltd.,** has 100 miles from Miniota to near McGregor to start in 1957. **Marine Pipeline & Dredging, Ltd.** has 30-in. Red River and Assiniboine crossing in Manitoba.

Completion: Red River crossing to be completed May 31. Assiniboine River crossing completed.

• **Union Gas Co. of Canada, Ltd.**

Project: 142 miles of 26-in. from Dawn Township to Hamilton, Ontario, plus 55 miles of 6 to 20-in. laterals, and 317 miles of 2 to 12-in. distribution lines.

Status: Planned.

Completion: November 30, 1957.

Project: 17 miles of 8 to 20-in. storage lines in Dawn Township, Ontario.

Status: Planned.

Completion: August 1957.

• **Westcoast Transmission Co., Ltd.**

Project: 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash.

Status: Under way. About two-thirds completed.

Contractors: **Dutton-Williams Brothers, Ltd.,** has 120 miles from Taylor, B. C., to Azouzetta Lake, completed; **Universal Pipe Lines, Ltd.,** subsidiary of **Mannix, Ltd.,** has 110 miles between Huntingdon and Kingsvalle, B. C., F. L. Byers, spread superintendent, office at Hops, B. C.; **Canadian Bechtel, Ltd.,** has 210 miles from Alexandria to Pine Pass, B. C., H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.; **R. A. Conyes Construction Co.,** has 210 miles; **River Construction Corp., Ltd.,** has under way 150 miles of gathering lines in northern Alberta and British Columbia; **Marine Pipeline & Dredging, Ltd.,** has Fraser and Peace River crossings, Waldo Trim, spread superintendent, offices at Fort Saint John and Hope, B. C.

Completion: Dutton-Williams section completed. R. A. Conyes section and Canadian Bechtel section to be completed September 1957. Marine Pipeline work to be completed June 30, 1957. Universal Pipe Lines, Ltd. will complete work September 1, 1957.

Project: 174 miles of 30-in. from Savanna Creek area to the Canadian-Idaho border.

Status: Proposed.

Foreign Crude-Oil Pipelines

Bolivian Gulf Oil Corp.

Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.

Status: Awaiting pipe.

Contractor: **Williams Brothers Co.**

Completion: December 1957.

• **Caltex**

Project: 30 miles of 30-in. from Duri field in Sumatra to Dumai where a deepwater terminal will be built. Line will be extended 35 miles of Minas field later.

Status: Planned.

Completion: Duri-Dumai line to be finished in 1959; extension to Minas later.

Cia. Shell de Venezuela

Project: 23 miles of 20-in., 5 miles of 16-in., 2 miles of 24-in. from Lake Maracaibo wells to Cabimas, Venezuela.

Status: Under way.

Contractor: **Brown & Root, Inc.**

Completion: April 1957.

• **Colombian Petroleum Co.**

Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.

Pipeline Patrol

Status: Planned.

- **Creole Petroleum Corp.**
  Project: 87 miles of 30-in. from Temblador field to Caripito in Venezuela.
  Status: Planned.
  Completion: 1959.
  Project: 9 miles of 26-in. from Ule to La Salina in Venezuela.
  Status: Planned.
  Completion: Late 1957.
- **Iraq Petroleum Co.**
  Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq and Turkey to the Turkish port of Iskenderun on the Mediterranean sea.
  Status: Proposed. Survey completed.
- **Mene Grande Oil Co.**
  Project: 59 miles of 30-in. from fields in Eastern Venezuela to Puerto La Cruz.
  Status: To start in 1957.
  Completion: First quarter 1958.
- **North-West Oil Pipelines Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)
  Project: 210-mile line from the refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.
  Status: Planned.
  Completion: 1959.
- **Royal Dutch-Shell**
  Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.
  Status: Company is considering project together with several other companies.

Sinclair Oil Corp. and Socony Mobil Oil Co. Co.
Project: 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.
Status: Under way.
Contractor: **Williams Brothers Sudamericano, Ltd.**
Completion: July 1957.

- **Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie**
  Project: Line in Sahara Desert area to move oil from Hassi Massaoud field. Two routes possible: 200 miles from the field northwest to Laghouat; 260 miles from the field to the north and slightly east to Biskra.
  Status: Under study.

Yacimientos Petrolifferos Fiscales (Argentina)
Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.
Status: Under way.
Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.
Project: 497 miles from Mendoza to Buenos Aires.
Status: Proposed.

Foreign Products Pipelines

Israeli Government
Project: A 6-in. line from the Haifa refinery to Tel Aviv.
Completion: Late 1957.

National Iranian Oil Co.
Project: 573 miles of 10-in. from Ahwaz to Teheran, Iran.
Contractor: **Enterpose of Paris,** has northern 236 miles. Southern section completed.

- **North Atlantic Treaty Organization (NATO)**
  Project: 2,000 miles of lines to airfields in parts of Europe.
  Status: Under way.
  Contractors: **Associated Pipeline Contractors, Inc.,** has 450 miles from Iskenderun, Turkey, to Batman. **TECHINT** (Compagnia Tecnica Internazionale), Milano, Italy, has

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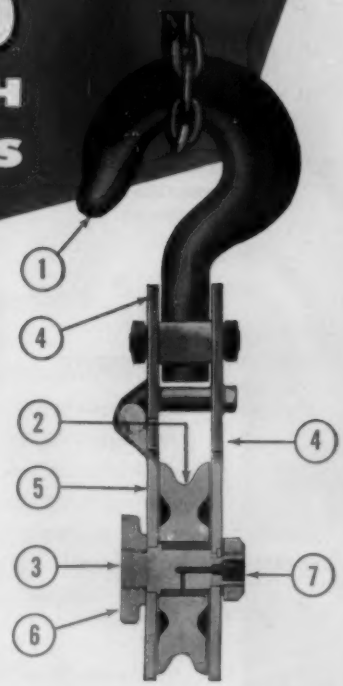

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Pipeline Patrol

205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956 on 300 miles of 12-in. between Marseille and Langres, France. Taking bids on 275 miles in northwestern France: 54 miles of 2-in. from Langres to Mirecourt, 63 miles of 2-in. from Mirecourt to Phalsbourg, 47 miles of 8-in. from Mirecourt to Metz, 30 miles of 8-in. from Phalsbourg to Deux Ponts, 35 miles of 8-in. from Phalsbourg to Strasbourg.

Foreign Natural-Gas Pipelines

Andes Pipeline Corp. (Subsidiary of Glenn McCarthy, Inc.)

Project: 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper-mining area.
Status: Proposed.
Contractor: Will do own work.

• **Attock Oil Co.**
Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.
Status: Planned.

Cia. Shell de Venezuela.

Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces.
Status: Under way.
Contractor: **Williams Brothers Co.**
Completion: 1957.

• **Empresa Nacional Del Petroleo.**
Project: 80 miles of 10-in. from Concon to Santiago, Chile.
Status: Planned.

Gaz de France

Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. lateral to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.
Status: Right-of-way work under way.
Contractor: Being handled by French contractors.
Completion: First stage in 1958; complete system in 1960.

Petroleos Mexicanos

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey in northern Mexico.
Status: Planned.

Sui Gas Transmission Co.

Project: 217 miles of 16-in. from Sui gas field to Moultan, Pakistan.
Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang, Magiana, and Montgomery.
Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.
Project: 145-mile line from Sylhet to Dacca, East Pakistan.
Status: Under consideration. If approved construction could start December 1958.

Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.

Project: 207 miles of 26-in. from Anaco fields to Caracas.
Status: Under way.
Contractor: **Fulghum Contracting Corp.** will be consultants; **Petrogas, S. A.** will engineer and construct the line.
Completion: Spring 1959.

• **Yacimientos Petroliferos Fiscales (Argentina)**
Project: 1,056 miles from Campo Duran to Buenos Aires.
Status: Proposed. Bids will be taken beginning the end of January 1957.
Status: Work starts April 15, 1957.

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Building petroleum refineries, petrochemical and chemical plants requires complete understanding of practical construction techniques. You know, and we know, that there is no substitute for experience, a thorough knowledge of tried-and-proved methods, in this business. But, there is an important something beyond this, too.

It is the "creative sense" ever present at Procon, the constant seeking for better, more practical, more economical ways to build the most efficient installations for our clients. We are ready to apply this creativeness to your construction problems.

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PROCON (*Canada*) LIMITED
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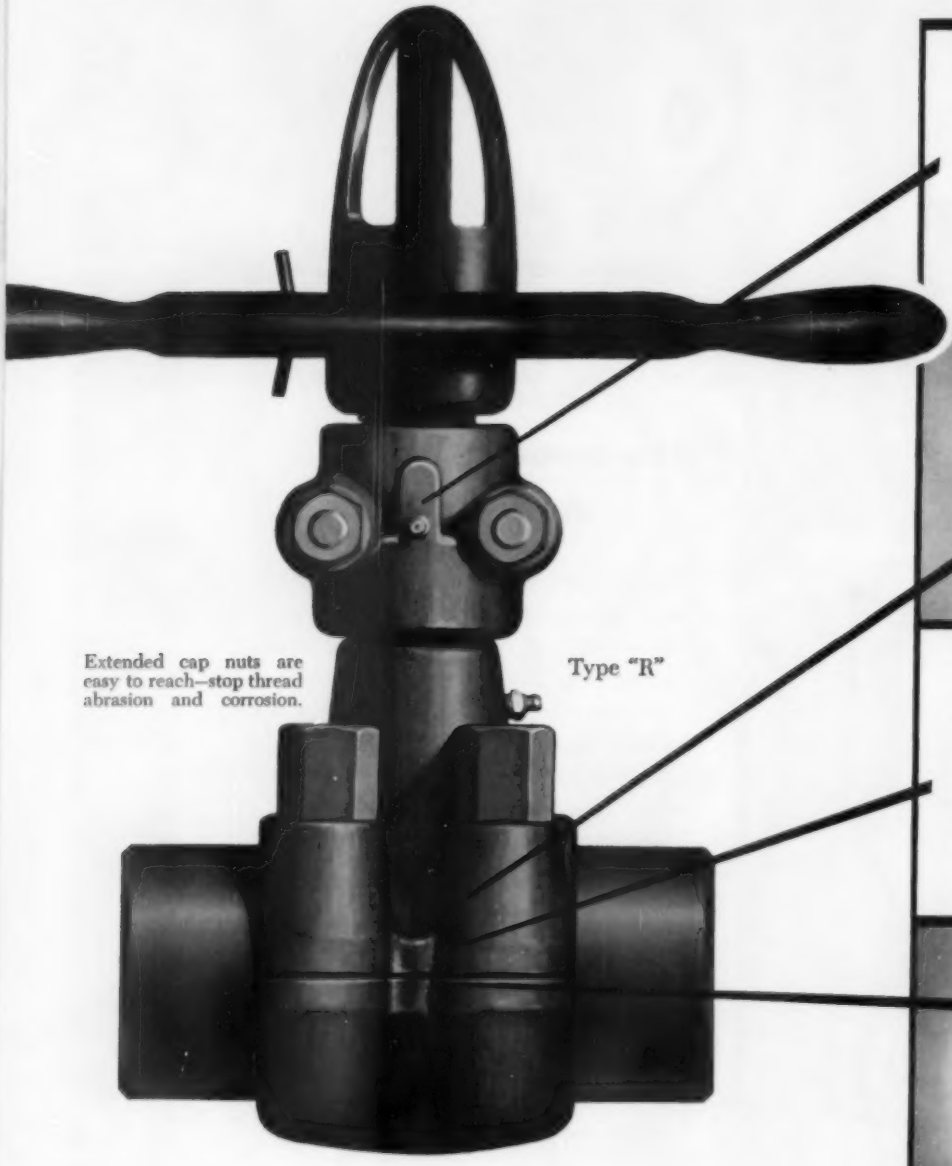
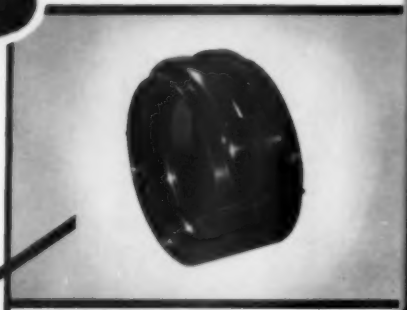
WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES



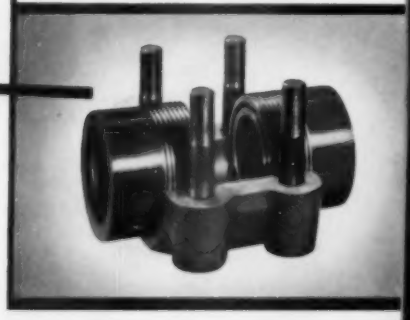
Extended cap nuts are easy to reach—stop thread abrasion and corrosion.

Type "R"

Ball-bearing stem nut on most sizes of the Type "R" affords easier operation — is interchangeable with Type "C" valves, if a Type "R" split bonnet is used.



The oversize carburized steel wear rings are sealed against the subs by "O" rings and are removed straight out with the gate packer as a unit.

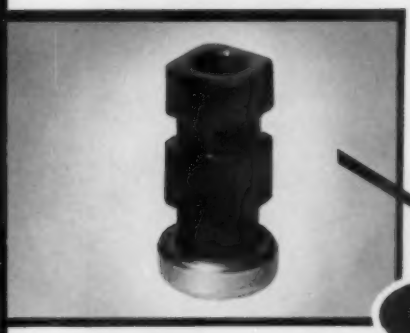


Cameron

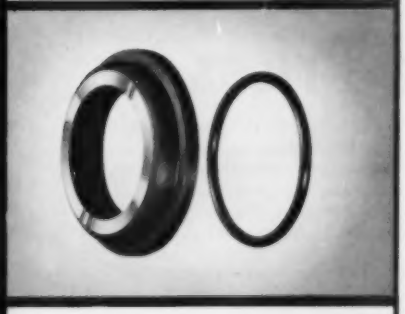
TYPE "R" RUGGED COMPANION TO THE FAMOUS FLEX-SEAL MUD VALVE

For 20 years the famous Cameron Type "C" Flex-Seal Mud Line Valve has been a standard of the drilling industry. Its rugged dependability, low maintenance and economical repair have secured its place on most drilling rigs throughout the oil world.

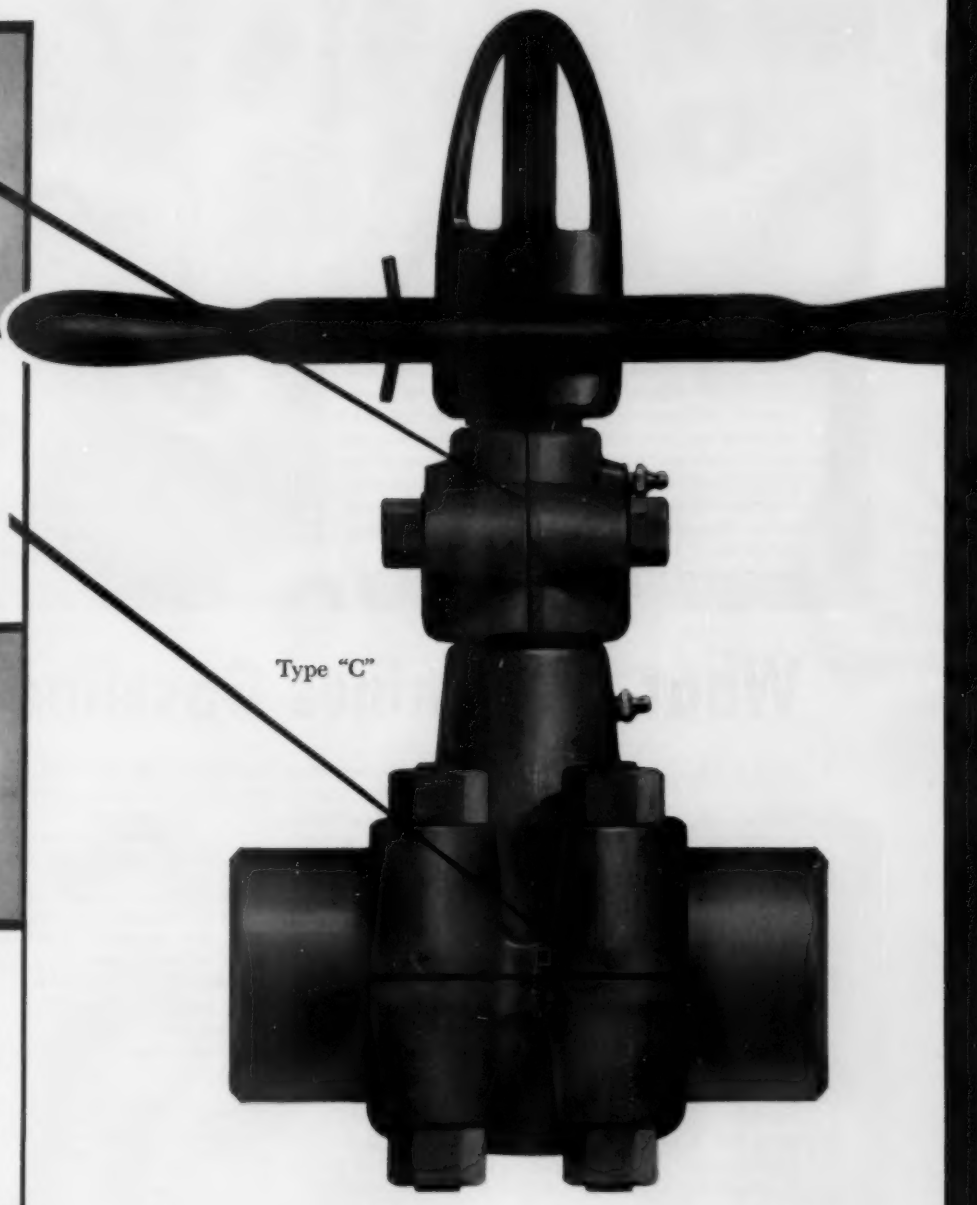
The increasing use of rigid mud manifolds on drilling barges, unitized power rigs and service trucks for cementing and formation fracturing has indicated the need for a companion valve. The Type "R" meets this need. Subs on the Type "R" are modified to permit the packer and wear rings to be changed as a unit without moving the subs apart as with the Type "C". With this revised construction the Type "R" subs are attached to the cap to form a rigid unit. At the same time, the subs may be changed or swivelled by removing the tack welds and replacing the worn part. The welds are structural only and not subject to pressure. Gates and packers are interchangeable between the Type "C" and the Type "R". The



Tough new compound in the big gate packer means lots more wear — fewer repairs. Replacement requires no special instructions or fixtures — no intricate positioning of gate stem threads.



Integral, welded subs and body cap make misalignment during repairs impossible. If a sub is damaged it may be separated and replaced rather than replacing an expensive body unit.



Type "C"

body and body cap may be interchanged. A ball-bearing nut assembly, standard in most sizes of the Type "R", will also fit the Type "C". Only the wear rings and subs are not interchangeable. The Type "C" may be easily converted to Type "R" by simply substituting subs, packer and wear rings.

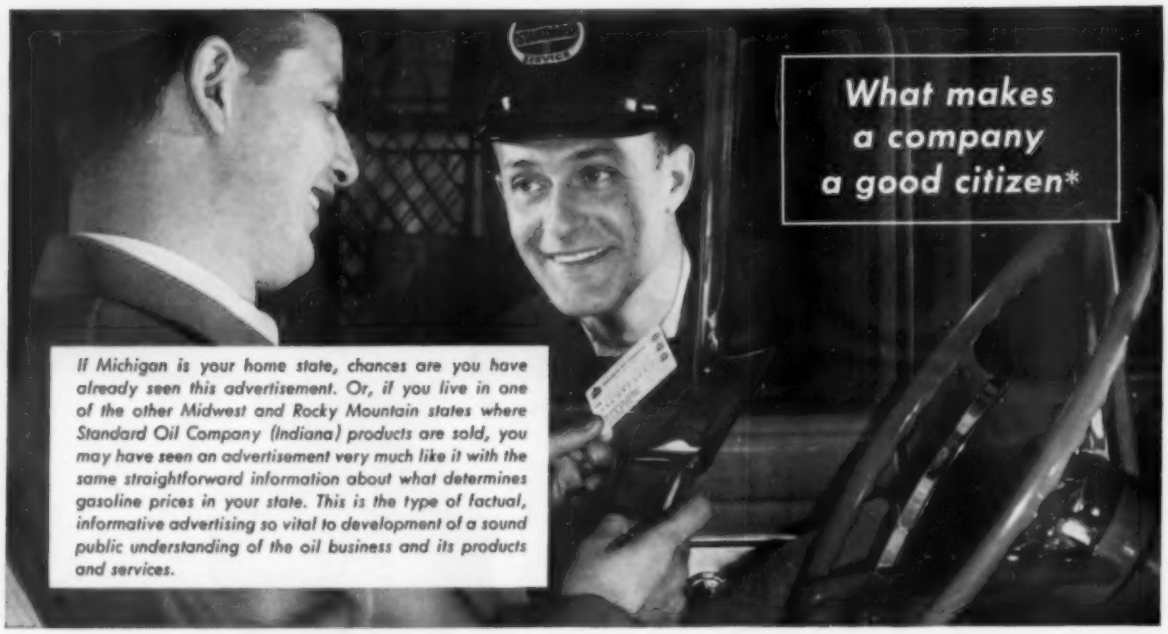
Easy-out packer and wear ring means quick repair with no misalignment.

Cameron

IRON WORKS, INC.

P. O. Box 1212-Houston, Texas

In England: Cameron Iron Works Ltd., Time & Life Bldg., New Bond Street, London W. 1 England


What makes a company a good citizen*
If Michigan is your home state, chances are you have already seen this advertisement. Or, if you live in one of the other Midwest and Rocky Mountain states where Standard Oil Company (Indiana) products are sold, you may have seen an advertisement very much like it with the same straightforward information about what determines gasoline prices in your state. This is the type of factual, informative advertising so vital to development of a sound public understanding of the oil business and its products and services.

What Determines Gasoline Prices?

Many people may not realize the number of items involved in the price of gasoline.

GASOLINE TAXES. A typical price of STANDARD RED CROWN Gasoline in mid-Michigan is 23 4/10 cents a gallon excluding direct taxes. That's right! Only 23 4/10 cents! Direct state and federal taxes on gasoline total 9 8/10 cents—*equal to 42 per cent* of the price of the gasoline alone—bringing the price to you to a total of 33 2/10 cents.

DEALER'S SHARE. The dealer, of course, knows that quality for quality he must meet competition to attract and hold business. At the same time, he must operate profitably to keep himself in business. To do so, he is entitled to a fair and reasonable mark-up, which is included in the 23 4/10 cents you actually pay for the gasoline itself. With this he supports himself and his family, pays his taxes and his help, pays for the many services he offers his customers. *He makes provision for all of these items in the few cents competition allows.*

OUT OF OUR PORTION of the 23 4/10 cents you actually pay for the gasoline itself, we find crude oil, transport it, refine it and then deliver the gasoline to your independent Standard Dealer. And money received from the sales of products enables us to pay the wages and salaries of our more than 51,000 employees, pay reasonable dividends to stockholders, and finance constant improvement in the quality of our products. For example, gasoline octane increases of the past 2 years added about 25 million dollars per year to our *continuing operating costs.* General wage increases of slightly over 4 per cent and 6 per cent in 1955 and 1956 increased our costs about 28 million dollars annually. *This total of about 53 million dollars over 1954 is a continuing annual cost,* and is expected to increase further during 1957.

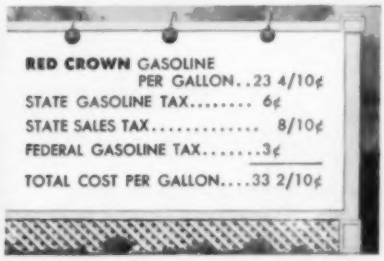
Yet by almost any yardstick you apply, whatever necessity you compare it with, gasoline is one of your best bargains today. That goes for quality, it goes for service, and it goes for price.

*** WHAT MAKES A COMPANY A GOOD CITIZEN?**

Well, one measure of citizenship is a company's frankness in discussing subjects that are of importance to its customers. Certainly price is such a subject. And we want you to know something about the many and complicated economic factors that determine the price of gasoline.

Our average cost of drilling an oil well in 1953 was about $80,000. Last year the average cost had risen to about $106,000. Many individual wells are more expensive, some costing upwards of $1 million.

More than 51,000 people earn their living at Standard Oil. They, like you, have had to meet higher living costs. And in the last 15 years, their wages and benefits have increased, on the average, 170 per cent.


RED CROWN GASOLINE PER GALLON..23 4/10¢
STATE GASOLINE TAX..... 6¢
STATE SALES TAX..... 8/10¢
FEDERAL GASOLINE TAX.....3¢
TOTAL COST PER GALLON....33 2/10¢

The taxes you pay on gasoline—equal to 42% of the cost of the gasoline itself—help to build and maintain Michigan's expanding highway system. You pay these direct taxes whenever you buy gasoline.

STANDARD OIL COMPANY (INDIANA) STANDARD

Among the

Drilling Contractors

Green & Heiser Drilling Co., Bakersfield, Calif., is drilling another well for Superior Oil Co. in the McClung area, 9 miles west of Bakersfield, in Kern County, California. It is a southwest offset to Superior's newly completed discovery well in the upper Stevens sand at 7,700 ft. The new test is at 35-33 Clark, in 33-29-26.

Como Drilling Co. is contractor on a deep semi-wildcat test Vasser & Howard, of New Orleans, are starting in the Southeast Houma area, in Terrebonne Parish, southeastern Louisiana. Contract calls for a 11,800-ft. test at 1 South Coast, in 12-17s-17e.

Penrod Drilling Co., Shreveport, is to drill a 12,000-ft. test about 5 miles southwest of White Castle field, in southern Iberia Parish, Louisiana Gulf Coast. It is a contract job for Placid Oil Co., one of Penrod's affiliated operating companies. Location is on the west bank of Grand River at 1 Wilberts, in 13-11s-11e.

Unit Drilling Co. is contractor on a 5,150-ft. wildcat test Colorado Oil & Gas Co. is starting in Ford County, southwestern Kansas. Location, at 1 Slattery, in 25-26s-23w, is about 11 miles east of Dodge City. Nearest production is 6 miles southeast in Kondo pool.

Woolf & Magee, Tyler, Tex., are drilling for Serio-Punches Oil Co., of Natches, Miss., at a wildcat location west of Sibley, in southwestern Adams County, southwestern Mississippi. Location, at 1 Bourbon & York, in 16-5n-3w, is slightly more than a mile south of Butler Lake field. It is a Wilcox test with sands below 6,500 ft.

Wilson Drilling Co., Jackson, Miss., has the contract on a Wilcox test John S. Callon is undertaking in northern Wilkinson County, southwestern Mississippi. It is set up to go to 7,500 ft. Location is on Callon's Crosby-Flowers unit, in 7-3n-1w, about 10 miles northeast of Woodville, and about 3 miles southeast of Darrington field.

Gregg Oil Co. has taken a contract job in northwestern Scott County, Mississippi. It is a 6,000-ft. test for E. W. Marks and G. C. Gabler, of New Orleans. Location, at 1 Burnham, in 35-8n-5e, is in the northwestern part of the county, near the Rankin County

SAFE RIG—Sam G. Fussell (second from left), tool pusher, and daylight-tour crewmen on Big Chief Drilling Co.'s Rig 33, display plaque and "Green Cross for Safety" flag awarded by American Association of Oilwell Drilling Contractors for operating a full year (1956) without a lost-time accident to any member of its crews. Fussell also received the A.A.O.D.C. toolpusher's certificate, and Herbert Traugott (extreme right), daylight driller, the association's driller's certificate for the same record. The rig's other two drillers, Joe Ford and E. F. Fillman (not shown) received certificates for going 2 years without a lost-time accident to themselves or their crews. In the picture, in addition to Fussell and Traugott, are Tom Newman (left), and C. L. Slate and D. M. Dill (third and fourth). The rig now is on Champlin Refining Co.'s indicated discovery well (1 McDonald), south of Woodward, in Woodward County, western Oklahoma.

Protects threads—prevents galling and seizing—gives tight seals—permits easy separation—lengthens drill string life. These are reasons why "Bestolife Lead Seal Tool Joint and Casing Compound has been the standard of the oil country for over twenty-five years. Unconditionally guaranteed.

Packed in 1¼, 5, 20 and 50 lb. containers. Sold by leading supply houses the world over.

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1601 E. NADEAU STREET
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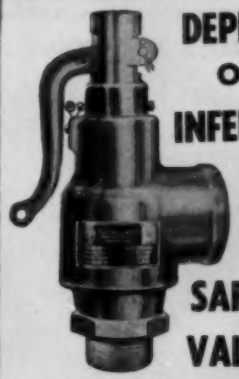

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- Tough malleable iron bodies.
- Stems of stainless steel.
- Valves and seats of nickel alloy or bronze.

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THE INFERNO CO.
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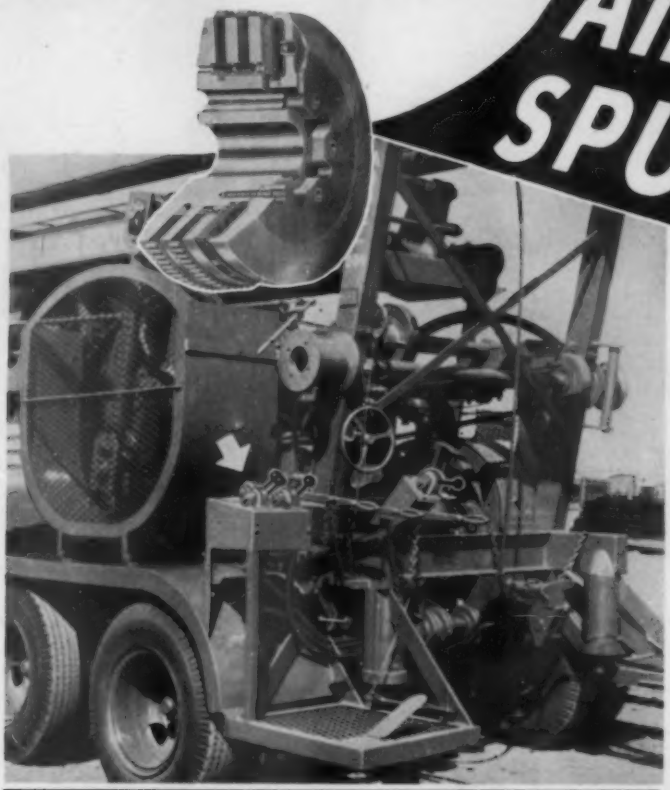
SHREVEPORT, LA.

WALKER-NEER AIR Clutch SPUDDERS



Acclaimed...

by owners and operators . . . "Sensationally more efficient, more trouble-free, a TREMENDOUS advancement" . . . the result of Walker-Neer's FIVE YEARS of building, field-testing, and improving air-clutch spudders.

Another WALKER-NEER *"FIRST!"*

Air clutches now standard or optional on most Walker-Neer Spudders—the first and only line of modern, field-proved, air-clutch spudders!

PICTURED: (At top left) the outstandingly efficient Wichita Air-Tube Disc Clutch, standard air-clutch on Walker-Neer Spudders; (at left) air control panel on C-34 Spudder; (below) Model C-34 clutch shaft with 2-plate, 18" air clutches—a prime example of the engineering skill and precision workmanship which assures you . . .

The Finest Air Clutch Performance . . . on the World's Most Modern Spudders!

ENGAGES SMOOTHLY . . . with no noise, shock, impact, or chatter. You "feel your load" as with mechanical disc clutch, yet with ease of direct air control.

TROUBLE-FREE: No adjustments! No lubrication! Both operation and maintenance are far simpler than with mechanical clutch.

LONGER LIFE: Actuating pressure is developed completely within the unit, eliminating strain, exterior thrust, and "saucering" effect. Plates last much longer.

SAFE: Releases instantly. Also, positive lock screw is provided for quick and easy mechanical engagement if air supply fails.

ECONOMICAL: Complete air-clutch equipment adds amazingly little to original spudder cost.

Before you buy any spudder investigate WALKER-NEER AIR-CLUTCH SPUDDERS

WALKER-NEER

MANUFACTURING COMPANY, INC.

P. O. BOX 2490 WICHITA FALLS, TEXAS

WALKER-NEER SPUDDERS AROUND THE WORLD

DISTRIBUTORS: Oil Well Supply Division; Bovaird Supply Co.; Jones & Laughlin Supply Division; Mid-Continent Supply Co.; Industrial Motor Service, Hoisington, Kan.; E. D. Taylor Co., Montebello, Calif.; Acme Well Supply (exclusive export agent except on North American Continent)

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CLEAN OUT CHOKING SAND

Excessive sand and sediment holds back your oil. For fast, easy clean out with fewer round trips and less downtime, use world famous Miller Sand Pumps.

Write for descriptive price list.

SAND PUMP SIZES IN STOCK

O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 in.
Lengths—20, 25, 30 ft.

Composite Catalog Page 3369

MILLER SAND PUMPS

MILLER SAND PUMP CO.

General Offices, Box 4516
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PUT OIL TO WORK *with* SIMPLEX HYDRAULIC JACKS *and* PULLERS

- Pull Bits, Casings, Valve Seats, Bushings, Wheels
- Lift and Skid Rigs, Machinery
- Bend or Straighten Pipe

SIMPLEX Hydraulic Jacks
Single and double pump models from 3 to 100 tons capacity.

SIMPLEX - Jenny Hydraulic Pullers
"Center-Hole" Pulls or pushes. Models 30 — 100 tons capacity.

Re-Mo-Trol Remote Control Puller
Safer to use, operates in tight spots. For pushing or pulling. "Center-Hole" on rams over 30 tons. 10-100 tons capacities.

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Simplex Jacks

TEMPLETON, KENLY & CO.

2539 GARDNER ROAD, BROADVIEW, ILLINOIS
A. C. Templeton, 5627 Del Roy Drive, Dallas, Texas

line. It is about 5½ miles southwest of Ludlow, and about 25 miles northeast of Jackson. Nearest production is at Loring, 20 miles northwest in Madison County, where Carter Oil Co. has two Smackover gas-condensate wells.

Del Mar Drilling Co., Corpus Christi, is getting under way on a deep test northeast of Roeder field, northeast of Nordheim, in southwestern DeWitt County, South Texas. Drilling is for Jake L. Hamon and K. A. Ehman. Location is at 1 Kleberg, in the Antonio Sidick Survey. It is slightly more than a mile from nearest production.

Mim Drilling Co. has a rig working for Texas Southern Oil Producing Co., of Houston, on a 5,800-ft. wildcat test 7 miles east of Seguin, in Guadalupe County, Southwest Texas. Its location, at 1 Turner and others, in the Robert Hall Survey, is about 3 miles from Darst Creek production.

Rex & Morris Drilling Co. El Dorado, Kans., has a new contract operation in western Kansas. It is a 4,750-ft. wildcat test for Aurora Gasoline Co. Location is 4 miles southeast of Jetmore, in Hodgeman County. It is 5½ miles northeast of Purdyville field, nearest production. Designation is 1 Pappin. Spot location is in 28-23s-23w.

Grey-Wolfe Drilling Co., Houston, has the contract on the 12,500-ft. test Charles H. Lawrence, Jr., and Texas Eastern Transmission Co. are to put down 2 miles south of Roanoke field, in Jefferson Davis Parish, Coastal Louisiana. The operation is listed as 1 Thomas with location in 25-9s-4w.

Power Rig Drilling Co., Lafayette, La., has a new contract job in the Cowpen Creek area, southeastern Beauregard Parish, southwestern Louisiana. It is for Floyd Oil Co. at 1 Baggett, in 14-6s-9w. Location is southeast of production. A 7,000-ft. test is planned.

Iran Drilling Co. has a new wildcat operation 3 miles south of Douglas, in Nacogdoches, eastern Texas. It is a contract job for W. M. Coats, of Longview, Tex., at 2 Boozer, in the John Durst Survey. Contract is for 6,000 ft.

April Production Co., El Dorado, Ark., has taken a contract job in Pike County, southern Arkansas. It is a 5,000-ft. test for York & Figge, California operators. Location, at 1 Langley-Presley, in 29-8s-23w, is 2¾ miles west of Antoine, in the southeastern part of the county.

B and W SCRATCHERS AND CENTRALIZERS

B and W Multi-Flex Scratcher
B and W Plain Stabilizer
B and W Latch-on Centralizer with Kon-Kave Bow
Multi-Flex Type
B and W Rotating Scratchers
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Complete field service is included when you specify B and W Scratchers and Centralizers. Our experienced service men, located in all active drilling areas, will install equipment and assist throughout the entire cementing operation.

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6908

SHOWCASE...

NEW EQUIPMENT

New Hewer Removes Stumps Quickly

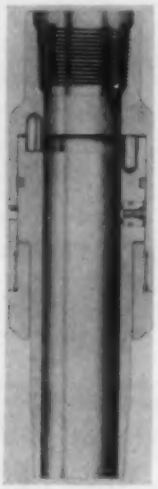
A practical solution to the problem of tree-stump removal is offered by this stump hewer. The new machine is designed to solve both the problems of stump removal and stump disposal by quickly grinding the tree stump down to as much as 14 in. below ground level. The depression can be covered with earth and the wood chips or shavings produced by the cutting action easily disposed of or used as mulch in the surrounding grass areas.

The machine consists of a cutting head fitted with heat-treated tool-steel blades swinging on an adjustable arm fixed to a center post. The head is operated by an electric motor powered by a generator. The entire unit is mounted on a mobile pneumatic-tired trailer that can be towed at full road speeds by automobile or truck.

Designed for fast one-man operation, the wheelbarrow type of handles guide the cutting head into the stump. They can be swung through an 8-ft. radius without moving the trailer. The head is adjustable to cut from 12 in. above to 14 in. below grade. The generator develops 2,500 watts and can be used to power other electric tools or function as an emergency lighting unit.

The trailer is only 6½ ft. wide, 8½ ft. long, and weighs 1,450 lb. Adjustable jacktype of supports keep the unit stable. The stump hewer cuts quickly without damage to sod or sidewalks, according to the maker. **Write or call: Exeter Co., P. O. Box 511, Bloomfield, N. J., for details on stump hewer.**

●



Tubing Drain Assures Dry Pulling Conditions

This new Page Type R tubing drain can provide safe, dry pulling conditions, the maker claims. By avoiding pulling the tubing string wet, time may be saved, while safer working conditions for the well crew are obtained.

The tubing drain is easy and consistent in operation. Turning the tubing to the right 350° opens it. A hydraulic-tubing anchor below the drain prevents accidental opening of the drain.

The tubing drain employs a Teflon bearing to eliminate friction. A rubber friction ring is incorporated to provide resistance against accidental opening while running in the hole.

The combination draining orifice and sealing plug carried in the mandrel will hold full well pressure in either direction. When the drain is rotated into a draining position, the sealing plug is blown out, leaving the orifice to protect the drain against fluid cutting.

This restricted flow prevents hydraulic disruption of the formation and consequent losses in production, the maker states.

(Continued on page 179)

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

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Described in OIL AND GAS JOURNAL - Issue of April 15, 1957

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Sun Oil Co. cracking unit at Marcus Hook, Pa.

Refineries Save $3,500,000 with B&W Carbon Monoxide Boilers

B&W Carbon Monoxide Boilers, in oil refineries, are compiling outstanding records. The seven units already on stream have produced, since 1953, savings of $3,500,000 in fuel costs. And every day they are in operation, they continue to save money. Each of these boilers is quickly paying for itself. No wonder a total of 15 units has been ordered to date.

Big fuel savings are achieved because B&W "CO" Boilers put sensible and combustible heat to work. In extended, sustained service they have proved their efficiency, reliability, and economy.

The cracking unit becomes independent of other steam sources. The boiler can be operated at all times, whether or not the cracking unit is on stream.

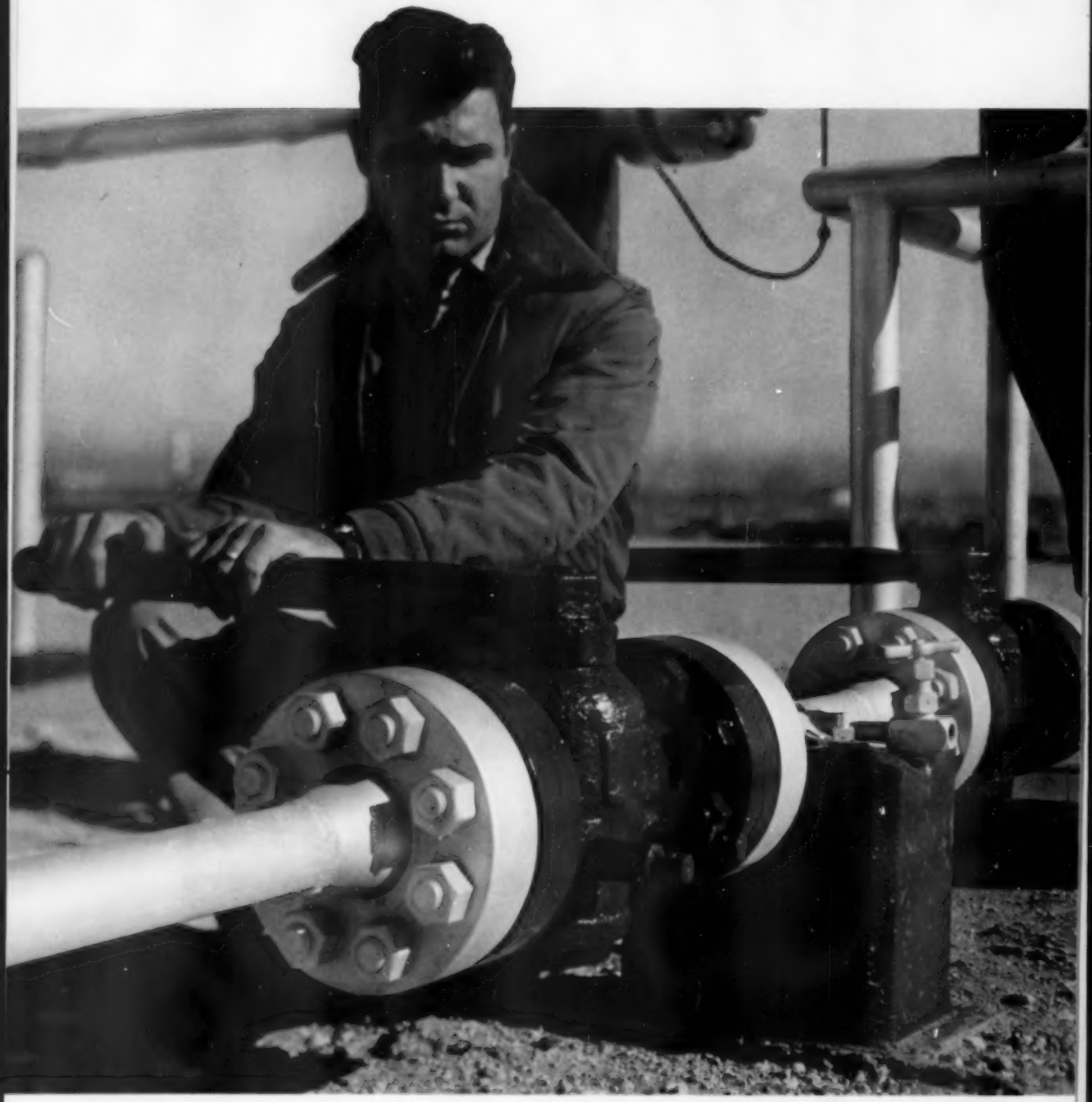
B&W engineers, experienced in meeting differing refinery conditions, can design a B&W "CO" Boiler to fit your specific requirements, for any steam pressure and temperature, for any size cracking unit. The Babcock & Wilcox Company, Boiler Division, Dept. OGJ 4, 161 East 42nd Street, New York 17, N. Y.

G-832-CO

BABCOCK & WILCOX

BOILER DIVISION

How these two brought lower valve costs to a West



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MISSION PLUG VALVES
Texas pressure maintenance plant

At the left, you see two of the three Mission Plug Valves that pointed the way to lower overall maintenance costs to the operators of a West Texas Plant. They proved to a skeptical management that Mission Valves *actually do cost less* because they last longer and require less maintenance.

These three valves were the only Mission Valves installed when the plant was built early in 1950. The two valves shown are installed on a scrubber blowdown near an injection well and the third was in the injection line just before the scrubber.

All three valves handle wet sour gas at 4000 psi. All have been in continuous service since 1950 and all three still work perfectly. They are among a very few of the original valves still operating.

Mission Plug Valves were originally accepted simply because no other valves were available. Their performance has been so outstanding that they are now among the first chosen for service at this plant.

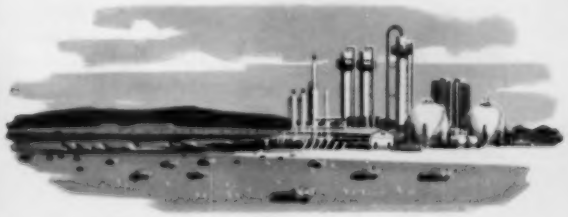
There are many reasons for the long life and dependability of Mission Valves, but the most important is the *Automatic-lubrication system* — exclusive with Mission in plug valves.

Without this system, a small leak could start and serious valve damage could occur before an attendant became aware that the valve was leaking.

But the automatic lubrication system serves as an untiring sentinel — automatically stopping leaks *before* they start — and before valve damage can take place.

Why don't you profit from this experience and install Mission *Automatic-Lubricated* Plug Valves on your wells or in your plants. You too, will discover a new low in valve costs and a new high in dependability.

Mission Plug Valves, like other Mission Products, are available through supply stores everywhere.



Nothing but the finest will bear the name of

MISSION
MANUFACTURING CO.

This six-inch Mission Plug Valve is one of three installed on a bypass manifold handling sweet gas. Other Mission Valves are installed at many locations in the plant.

When You Use Armco Casing

the job goes fast • costs stay low

Casing jobs go fast with Armco Slip-Joint Casing. Just stab the end of the next joint into the collar, make a quick weld, and the string is ready to lower. Armco Casing comes in long, 40-foot lengths. This means fewer joints in the string —less running time. Line-up and stabbing go quickly and easily with the uniformly round diameter and square cut ends of Armco Casing.

Wide size range saves money

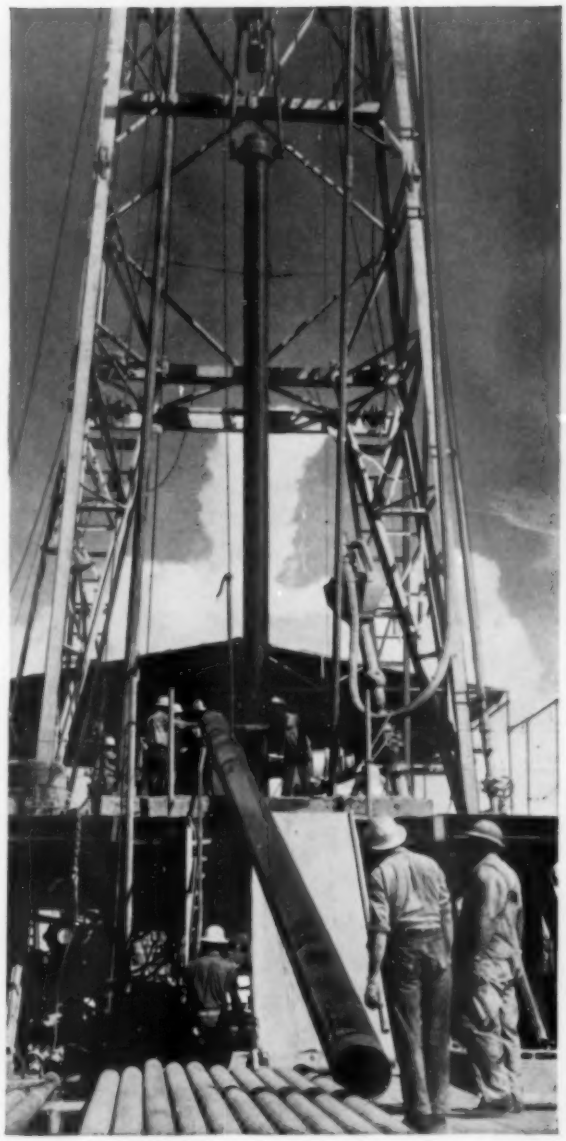
Armco Casing is supplied in a wide range of diameters (6 to 36 inches) and wall thicknesses ($\frac{3}{16}$ to $\frac{1}{2}$ inch). By ordering *exactly* what you need, you get maximum footage per ton of steel.

Quickly Available

Armco Casing is distributed by National Tank Company from 28 stocking points throughout the oil country. When you have a "rush" job, a phone call to the nearest stock point will start the casing on the way.

Write for complete data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 4517 Curtis Street, Middletown, Ohio • 201 KOME Building, Tulsa, Oklahoma • Subsidiary of Armco Steel Corporation • Export: The Armco International Corporation.

The Armco Slip-Joint Collar holds the next joint in alignment while welder makes a fast downhand fillet weld.



ARMCO SLIP-JOINT CASING

Distributed by National Tank Company, Tulsa, Oklahoma. In Canada: National Tank Company, Ltd., Edmonton, Alberta

National Tank Company Stocking Points for Armco Casing: Edmonton, Canada; Swift Current, Canada; Williston, North Dakota; Casper, Wyoming; Kimball, Nebraska; Sidney, Nebraska; Brush, Colorado; Great Bend, Kansas; Liberal, Kansas; Pawhuska, Oklahoma; Oklahoma City, Oklahoma; Seminole, Oklahoma; Farmington, New Mexico; Hobbs, New Mexico; Pampa, Texas; Lubbock, Texas; Snyder, Texas; Abilene, Texas; Electra, Texas; Odessa, Texas; Corpus Christi, Texas; Houston, Texas; Shreveport, Louisiana; Lake Charles, Louisiana; New Iberia, Louisiana; Harvey, Louisiana; Clay City, Illinois; New Harmony, Indiana.

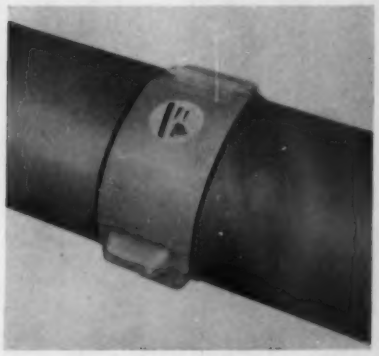
ARMCO®

SHOWCASE . . .

New Equipment

The tubing pressure is equalized, releasing any hydraulic tools in the string. **Write or call: Page Oil Tools Co., Inc., 3356 Lime Street, Long Beach, Calif., for details on Type R tubing drain.**

●



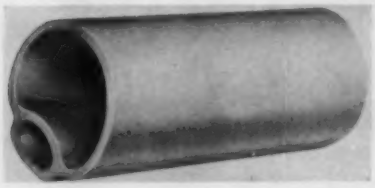
Casing Insulator Designed For Big-Inch Pipelines

This new WmSon steel-clad insulator is designed for big-inch pipelines in oversize casings under highways and railroads. It's available for all pipelines with diameters of 16 in. and larger.

The design features of the insulator include hollow forged-steel runners machine welded to a one-piece flexible steel band. The test load is 92,550 lb. per runner.

The sling-joint design used prevents the butt edges of the band from digging into the pipe coating. And a thick insulating liner of oil-resistant rubber secured to the high-tensile-strength steel band provides positive insulation, the maker reports. **Write or call: T. D. Williamson, Inc., P. O. Box 4038, Tulsa 9, Okla., for details on steel-clad insulator.**

●



Stream-Traced Piping Now Has Rounded Shape

Lower cost and higher efficiency of steam-traced piping now is possible with this new design in Unitrace, a method of heating product pipelines, according to the maker. Originally oval in shape, the one-piece steam-traced piping now has a cross-section matching standard pipe sizes. It is available in nominal sizes of 1½, 2, 3, and 4 in.

In use, the new design boosts the efficiency of Unitrace by (1) increasing the transfer of heat internally and (2) by cutting heat loss of external radiation.

These characteristics, combined with the corrosion-resistance of aluminum, make the piping suited for a wide range of products that must be handled by steam-traced piping. **Write or call: Aluminum Co. of America, 790 Alcoa Bldg., Pittsburgh 19, Pa., for details on Unitrace.**

●

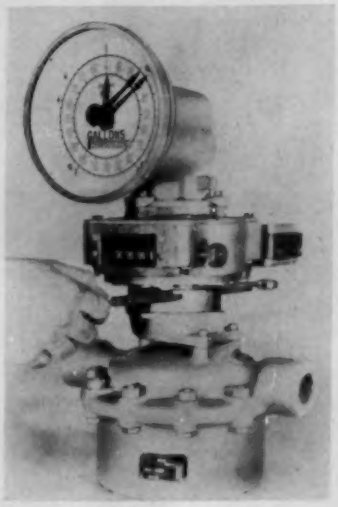
Lining Material Protects Process-System Components

The metal components of chemical-process systems can be protected with this new corrosion-resistant lining material. Called Saraloy 898, the product is an elastomeric copolymer based on vinylidene chloride. It is a flexible thermopolastic with unusual resistance to a broad range of acids, alkalis, salt solutions, and solvents commonly found in storage tanks, processing tanks, medium-to-large diameter pipe and fittings, fume ducts, and hoods.

Saraloy 898 is supplied in standard 37 by 133-in. sheets in ⅛ through ⅜-in. thicknesses. It can be readily installed in the field or in an applicator's plant by employing a chemically resistant adhesive system.

There is no need for vulcanization after the material has been applied. And the material has good strength and abrasion resistance, will not support combustion, and has high elongation and flexibility. **Write or call Dow Chemical Co., Midland, Mich., for details on Saraloy 898.**

●



Automatic Control System Speeds Liquid Metering

This new Rockwell explosionproof control system for liquid metering provides for automatic-switch control of all pumps and quantity-control valves at the meter. Upon completion of a predetermined liquid delivery, a switch is automatically thrown, opening an electrical circuit and cutting off simultaneously all liquid flow at the meter and all pumping action.

The system includes a new accessory control switch, a predetermining reg-

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to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of **April 15, 1957**

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

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BEFORE RODINE was adopted. Note the complete breakdown of the walls of the down-well tubing and casing.

AFTER RODINE was put to use. Though the well is highly acidic, little corrosion of the tubing and casing occurs now.

ACP Rodine® INHIBITS CORROSION IN SWEET WELLS, CONDENSATE WELLS, AND SECONDARY RECOVERY OPERATIONS—COSTS ONLY PENNIES A DAY

For just a few pennies a day you can minimize corrosion that costs you thousands of dollars annually. ACP Rodine will inhibit corrosion, cut maintenance and replacement costs, help prevent loss of production. It is readily soluble in water and brine, is effective over 200°F, can be added to the well by slugging (since it is heavier than the crude, it rapidly sinks into the water layer at the bottom of the well), or by proportioning pumps. And it does not promote or stabilize emulsion.

Specify whether your corrosion problem is in sweet wells, condensate wells, or secondary recovery operations. We'll send technical data and samples. Or our field engineering staff will cooperate with you in corrosion studies, including coupon service and fluid analysis.

AMERICAN CHEMICAL PAINT COMPANY, Ambler 39, Pa.

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ister and latch box, and a quantity control valve—all installed at the meter.

Where repeated deliveries of a fixed amount of liquid are required, a special factory-set predetermining register is available.

This device saves time on fixed-volume deliveries to barrels and mixing tanks by eliminating resetting of the register after each run. **Write or call: Meter and Valve Div., Rockwell Mfg. Co., 400 North Lexington Avenue, Pittsburgh 8, Pa., for Bulletin OG-327.**

●

Hydraulic Pump Developed For 2,000 Psi. Service

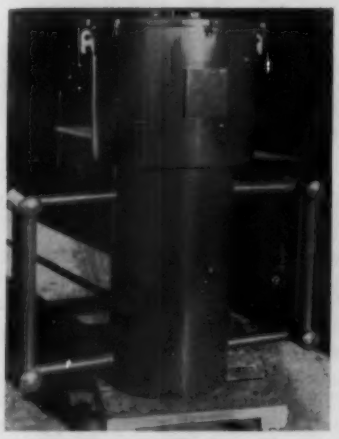
Deliveries of up to 100 g.p.m. at speeds up to 1,800 r.p.m. are achieved by this new balanced-vane hydraulic pump developed for continuous 2,000 psi. service. Known as the T series, the pump is available with either clockwise or counterclockwise shaft rotation.

Shaft rotation is easily changed by indexing the cam ring to the dowel-pin hole with an arrow indicating the desired direction of rotation.

The pump consists of (1) a housing which provides an outlet connection, a bore for support of the shaft bearing and shaft assembly, and a larger bore which contains the floating pumping cartridge consisting of a front port plate, vane, rotor, and cam-ring assembly; and (2) a rear port plate with a shaft-end support bearing. Because of their strong shaft support, the bearings permit use of the pump in applications with high shaft-side loading.

Two bolt-threaded flanges are provided as standard equipment. But four-bolt hydraulic connections are available for use with S.E.A. four-bolt split-flange connectors. A nose type of shaft seal, designed to withstand inlet pressures up to 100 psi, provides a positive seal. **Write or call: Denison Engineering Div. American Brake Shoe Co., 1176 Dublin Road, Columbus 16, Ohio, for details on T-series pump.**

●



Direct-Burial Transformer Eliminates Power Poles

A valuable feature of this Esco direct-burial transformer is that it can be completely buried, with the top from 3 to 4 ft. below the ground surface. Oil-immersed and earth-cooled, the transformer provides single-phase rating of 15 to 100 kva. and three-phase ratings of 45, 75, and 112½ kva.

Combined with improved cable and other materials, it allows the elimination of poles, providing improved appearance and safety. And storm, fire, traffic accidents, and similar mainte-

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On cooling towers and spray ponds, this head will produce an efficient and uniform spray at low pressure.

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Oakite cleaning saves much time, work, money

Even tenacious, heaviest soils succumb to specialized Oakite materials. Applied by Oakite mechanized fog, steam or spray methods, they're making short work of toughest tank car or barge cleaning jobs (2 cars cleaned in 8 hours vs. 1 steamed for 48 hours!)—and with savings in material (74% for one user!)

And in just 7 minutes, one barrel house cleans, strips paint and conditions used drums good as new—good evidence that Oakite cleaning is both fast and *thorough*.

But these are just two in a wide range of cleaning jobs where you can benefit. Take a new look at your cleaning operations through the Oakite Man's eyes . . . or send for Bulletin F-7629 which tells more. Oakite Products, Inc., 39 Rector Street, New York 6, N. Y.

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SHOWCASE . . .

New Equipment

nace problems may be virtually eliminated, the maker points out.

The transformer's primary circuit is carried in standard neoprene or other single, concentric, or three-conductor cables, making entrance to the buried tank through wiping sleeves or stuffing boxes, depending on the cable used.

The secondary circuit can be placed through three or four-conductor cables, connected to provide a correction for the voltage variation normally handled by tap changers. **Write or call: Electrical Service Co., P. O. Box 1039, Greenville, Tex., for details on direct-burial transformers.**

●

Control Valve Operates Without Stuffing Box

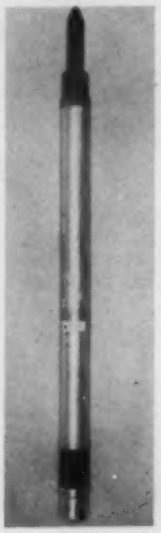
A new development in valves for water-treating, and process plants is this Uniflow air-operated control valve.

Its optional features include: (1) handwheel type of limit stops, (2) plastic position indicators, and (3) microswitch attachments for actuating remote visible or audible signals. The valve has a streamlined flow area that's free from pockets, grooves, or other crevices to assure high flow efficiency.

It's available in a variety of body materials, body linings, and valve-diaphragm materials for a variety of flow-control services. Available valve sizes range from ½ to 6 in., for on-off throttling control.

The available valve types are springless, close-coupled, and spring type. **Write or call: Uniflow Valve Corp., 19 Quine Street, Cranford, N. J., for Bulletin 114R.**

Oil-Field Tool Charts Underground Cavities



The size and shape of underground cavities are measured by this new electric-line tool by converting reflected sound waves into distance. Called a Sonar caliper, the oil-field tool has been adapted from devices used in sonic navigation and ranging.

It was specifically designed to measure brine-well cavities. However, it also appears to have applications in determining the capacity of L.P.G. storage reservoirs. A survey with the caliper is made up of a series of horizontal cross-sections of the underground cavity. Each one shows the size and shape of the cavity at a given depth.

The caliper works on the pulse-echo idea, timing the rate of travel of sound through a fluid medium. Sound waves produced by the subsurface tool are picked up by a receiver, after they have traveled to the cavity wall and back. A timing device records the interval, which is converted into distance. The outside circumference of the cavity is shown on a Polariod photo-recording unit.

Accuracy of the Sonar caliper, from both a range and directional standpoint, is estimated at ± 5 per cent.

The tool is 50 in. long and 3½ in. in diameter. Its size permits it to be run through 4-in. i.d. pipe, suspended on a single-conductor wire line. The caliper operates on 115-volt a.c. 60-cycle power and is designed for use at temperatures up to 160° F.

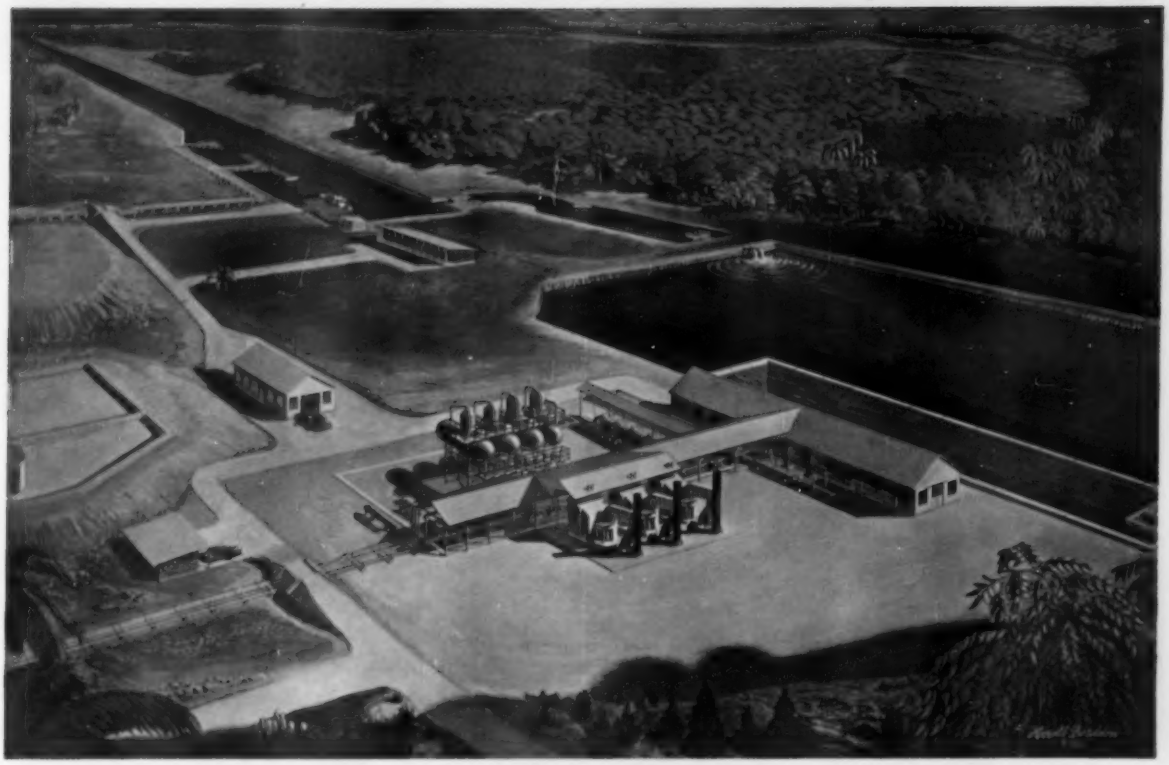
The receiving and recording equipment is contained in a truck on the surface, along with depth-measuring and cable-pulling equipment. **Write or call: Dowell Incorporated, P. O. Box 536, Tulsa, Okla., for details on Sonar caliper.**

●

Railway Motors, Generators Adapted for Oil-Well Drilling

These Westinghouse traction motors and generators formally used for railroad service are now available to make up a power package to drive draw works and mud pumps for deep-rotary drilling. The traction motors and gene-

(Continued on page 185)



Sulphur *From New Mining Project in Mexico of GULF SULPHUR CORPORATION*

Since June, 1956, Gulf Sulphur has been producing sulphur by the Frasch method on the Isthmus of Tehuantepec. The completed project, designed and installed by Hudson, includes water treating and hot water plant, pipelines, relay stations, canals, docks, liquid sulphur barges, solid sulphur storage, and staff housing. This efficiently operating plant with complete dock facilities at Coatzacoalcos makes available to world markets the large sulphur reserves of Gulf Sulphur Corporation.

Production capacity is 1500 long tons per day with present plant facilities which are designed for expansion to produce 3,300 tons per day.

The completion of these facilities on the Isthmus of Tehuantepec adds to the long list of clients entrusting to Hudson the design, procurement and construction of major mining, chemical and petroleum plant projects in the United States, Mexico, South America, Canada, Europe, the Orient, and the Near East.

DESIGNERS AND CONSTRUCTORS OF MINING, CHEMICAL, PETRO-CHEMICAL AND OIL AND GAS PROCESSING PLANTS

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Special facings, bores, drilling, threading and special machining available.

The long life and precision workmanship you have a right to expect in the flanges you buy are assured when you order Phoenix forged steel flanges. You simply can't buy a better flange! It costs no more for Phoenix quality and *service*. That's why it's always worthwhile discussing your pipe flange requirements with the Phoenix representative.

A serrated gasket surface finish is standard on all Phoenix flanges with raised facings.

Write for handy 36 page pocket-size reference booklet containing useful data on flanges. It's FREE!

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New Equipment

rators have been combined with a White-Superior diesel engine to produce a drilling unit with high horsepower in a small space.

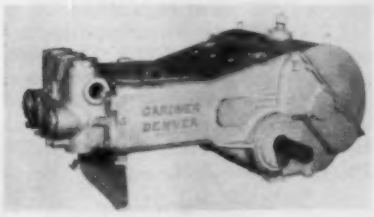
The draw-works drive unit is a skid-mounted heavy-duty traction motor rated at 1,000 hp. continuous output at 1,100 r.p.m., with an intermittent rating of 1,250 hp. This unit also provides the drive power for operating the rotary table.

It responds instantly to speed changes, providing rapid acceleration for fast drill-stem handling. Variations in motor output follow closely the voltage to the motor. Thus, to increase or decrease the motor output, it is only necessary to increase or decrease the generator voltage by moving the controls.

The mud-pump-drive unit is the same as the draw-works-drive unit. Each one is mounted on an individual skid. Two motors are used for mud-pump operation. This duplication assures continuous operation, guarding against complete loss of power or mud circulation.

The motors use series field windings for ruggedness, simplicity, and suitable characteristics. Separate excitation is used for the draw-works motor's fields to assure satisfactory control of speed. The motors are equipped with double-shaft extensions. When the second extension is not used, it is covered by a protective cap.

The 550-kw. shunt generators are identical to the motors except for the main field coils and field terminals. **Write or call: Westinghouse Electric Corp., Box 2278 Pittsburgh 30, Pa., for details on traction motors and generators for rotary drilling.**

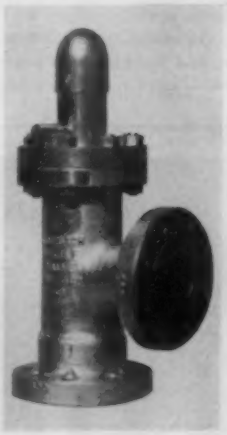


Well-Servicing Pump Offers Increased Efficiency

More efficient cementing, acidizing, and fracturing operations may be achieved with this newly designed triplex plunger pump, according to the manufacturer. The pump is available with an underslung jackshaft, which brings the jackshaft in closer connection with the power takeoff provided by the truck. As a result, power transmission may be more direct and pumping operations more efficient. The pump can be obtained with standard upper jackshaft construction.

The 8-in. stroke pump is rated at 310 b.hp. for this service. With 4½-in. plungers, it delivers 290 g.p.m. at 1,550 psi. and up to 56 g.p.m. at 8,000 psi. With 4-in. plungers, its capacity ranges from 228 g.p.m. at 2,000 psi. to 44 g.p.m. at 10,000 psi.

The pump is 57½ in. wide and 85⅞ in. long. It weighs 6,350 lb. Positive lubrication is provided for all power-end parts, eccentric drive, and the double-helical gears. Special plungers are available to meet service requirements. **Write or call: Gardner-Denver Co., Quincy, Ill., for details on 310 b.hp. well-servicing pump.**



Relief Valve Reseats At Set Pressure

Adapted for gases and vapors, this new pilot-operated pressure relief valve is certified under A.S.M.E. Unfired Pressure Vessel Code (Sec. 8, Par. UG-131). The Model 416 answers the need for a simple and accurate, yet safe and dependable, means of relieving excessive pressures at strategic points in pressure systems due to surges, line blocks, control failure, or human error, the maker claims.

Line pressure is utilized for opening and closing the valve. Opening pressure is preset by application of spring load. The valve is designed for instantaneous opening to full capacity and for automatic reseating at present pressure with no chatter or wire-drawing at the seat.

It can be functionally tested at any pressure by hand lifting the pilot stem. Opening and closing pressures can be set accurately without flowing the main valve. There are only two moving assemblies. All elements of the valve are easily accessible for maintenance and inspection. The stem, guide, seat, and spring are of stainless steel.

The valve is suitable for operation at temperatures up to 300° F.—on special order, 400° F. valves are available. The stainless-steel spring is unaffected by the low temperatures encountered on gas transmission lines in winter operation. **Write or call: Kinzbach Tool Co., Inc., 2411 Summer Street, Houston, Tex., for details on Model 416 relief valve.**

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of April 15, 1957

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

SHOWCASE . . .

New Literature

Nonindicating Pneumatic Pressure Transmitter. Specification S705-1 describes the Brown nonindicating pneumatic pressure transmitter for vacuum or pressure measurement. Using a spiral or spring-and-bellows primary element, it will measure and transmit pressures from 0 to 90 in. of water to 0 to 4,000 psi. The case, 11¼ in. sq. and 4½ in. deep, can be flush or surface mounted. The data sheet presents ordering information and specifications of the unit. **Write or call: Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Avenues, Philadelphia 44, Pa., for Specification S705-1.**

●

Indicators for Temperature. Four-page Data Sheet ND46-33(23) presents concise information about the electronic Speedomax G potentiometer instruments, which indicate thermocouple temperatures on a drum type of scale 25½ in. long. This sheet completely lists features, specifications, and ranges for: (1) a standard-case instrument with door-mounted switches, (2) a small-case instrument used with separately mounted switches, and (3) a console instrument for desk-top mounting, for as many as 200 thermocouple points. **Write or call: Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Pa., for Data Sheet ND46-33(23).**

●

Relief-Type Fitting Lubrication for fast, easy bearing lubrication is described and pictured in four-page Bulletin BU-61. This bulletin describes and illustrates the advantages of this special relief type of lubrication fitting, which can be easily attached to bearing housings of motors, machines, or pillow blocks equipped with conventional relief plugs. Twenty photographs and drawings illustrate the features of the fitting, including its patented cap that snaps open or shut at the flip of a finger, and the internally flared body for free discharge of excess grease. **Write or call: Keystone Lubricating Co., 3100 North Twenty-first Street, Philadelphia 32, Pa., for Bulletin BU-61.**

●

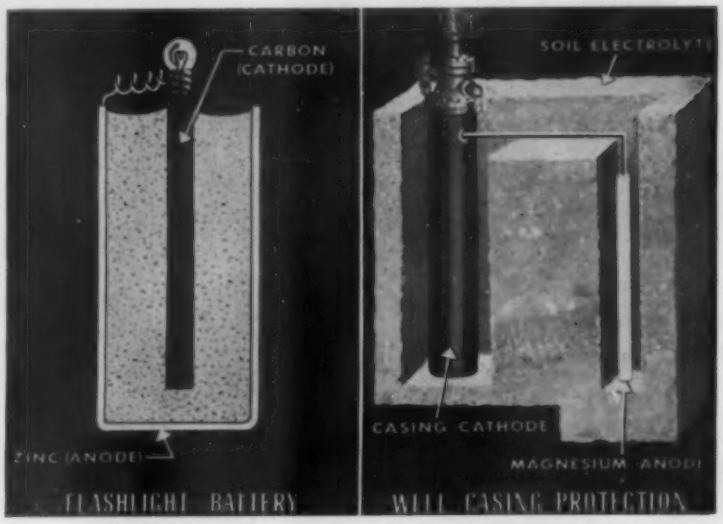
Water-Treating Products and Processes. Comprising 32 pages and fully illustrated, this bulletin deals with water and waste-treatment equipment designed and manufactured by Infilco, Inc. Containing cross-references for bulletins devoted to specific equipment for industrial waste treatment, Bulletin 80 is a handy informational catalog. **Write or call: Infilco Inc., Tucson, Ariz., for Bulletin 80.**

●

Single-Drum Multipurpose Portable Hoists, ranging in sizes from 0.9 to 15 hp. are the subject of new 12-page, two-color Booklet 3-31. The well-illustrated booklet carries descriptions and specifications for the Joy line of air, electric, and gasoline-driven hoists. The hoists have lifting capacities ranging from 750 to 5,000 lb. at rope speeds up to 125 ft. per minute. Wire-rope capacities range from 200 to 1,500 ft. The booklet also contains cutaway photographs illustrating the construction features of the hoists. **Write or call: Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa., for Booklet 3-31.**

●

Motion Transducers. Instrumentation Data Sheet 10.18-12 explains how Sostman motion transducers can be used with any Brown ElectroniK instrument wherever linear or angular motion must be measured with a high degree of reliability and accuracy. The data sheet illustrates typical applications, performance data, and construction features for both linear and angular-



HOW NATURE'S BATTERY PROTECTS WELL CASING

In an ordinary flashlight battery current flows from the zinc case (anode) through an electrolyte to the carbon rod (cathode). The zinc anode is corroded away.

You can protect the casing in your oil and gas wells from external corrosion by completing nature's battery. Add a magnesium anode bed and let the well casing be the cathode. The soil between the two acts as the electrolyte.

CSI engineers—pioneers in the field—have protected hundreds of wells in this way: They first survey the wells, using special surface instruments designed by CSI. Polarization curves are plotted to determine the current required for cathodic protection. Then magnesium anodes are installed. Protection designed for 10 years has averaged about $350 per well.

CSI offers expert engineering and installation services—plus a complete line of Dow magnesium anodes and other brand-name cathodic protection supplies at competitive prices. Call or write today. Estimates or quotations without obligation.

CSI

CORROSION SERVICES INCORPORATED
TULSA, OKLAHOMA

P. O. Box 7343, Dept. J-6 Telephone: Circle 5-1351

motion types of motion transducers. **Write or call: Minneapolis-Honeywell Regulator Co., Wayne & Windrim Avenues, Philadelphia 44, Pa., for Data Sheet 10.18-12.**

●

Power Units. Eight-page Booklet CR-513-G, entitled "International Power Units Make Your Most Profitable Power Partners," contains on-the-job photos displaying the power units as propelling components for mud pumps on a drilling rig and for blowers and compressors. The booklet also gives brief specifications of the power-unit line, which includes three 6-cylinder and three 4-cylinder diesels, and six 6-cylinder and four 4-cylinder carbureted units. **Write or call: International Harvester Co., Construction Equipment Div., 180 North Michigan Avenue, Chicago 1, Ill., for Booklet CR-513-G.**

●

Wire Rope Slings, available in three types, and their suggested applications are described and illustrated in these three folders. Uniflex slings are designed for applications where abrasion is an important factor. Multiflex slings, made from six-part flat braids, are designed for maximum load-bearing surface area and ultimate flexibility in one direction. Maxiflex slings provide superior flexibility in all directions. Each leg of a Maxiflex sling is made up of eight identical wire ropes braided together to form a round braid. **Write or call: Colorado Fuel & Iron Corp., 575 Madison Avenue, New York, N. Y., for wire-rope-sling folders.**

●

Two-Way Radio Selective-Calling. New Bulletins ECR-448 and ECR-439 describe and explain a two-way selective calling system. Bulletin ECR-448 describes individual call, which enables an operator to turn down radio volume until he receives a light or buzzer signal indicating an incoming call. Bulletin ECR-439 explains group call, showing how a radio-equipped fleet may be subdivided into as many as ten different groups according to job functions, by types of vehicles, or by locations served. **Write or call: General Electric Co., Electronics Park, Syracuse, N. Y., for Bulletins ECR-448 and ECR-439.**

●

Protective Coatings Brochure 1-7, four pages, two colors, photographically illustrates the application of protective coatings and linings. The brochure lists coatings and linings applied by Metalweld. Among these are: sheet linings, sprayed metal coatings, synthetic resin, and combination coatings. The brochure also gives data on sand and grit blasting as well as fabrication and major repairs of process equipment. **Write or call: Protective Coatings Div., Metalweld, Inc., Scotts Lane and Abbottsford Avenue, Philadelphia 29, Pa., for Brochure 1-7.**

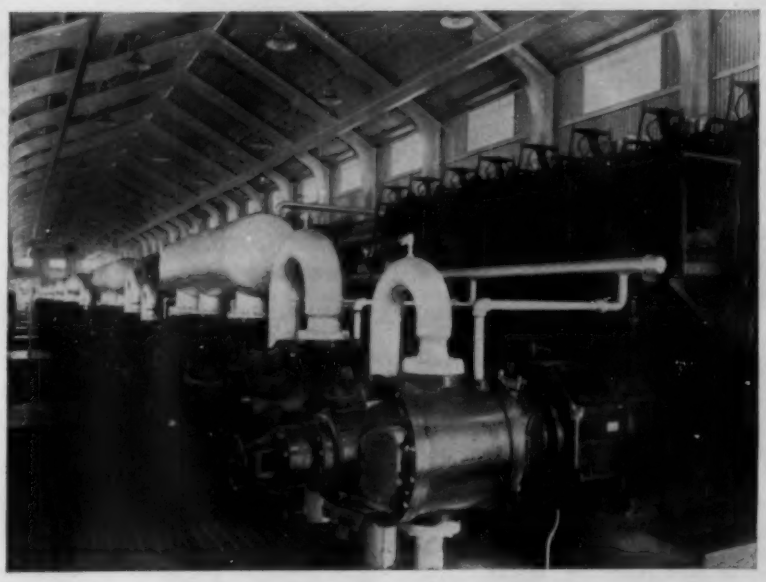
●

Traveling Blocks. Four-page Bulletin 471 covers National traveling blocks ranging from 90 to 450 tons and containing three to six sheaves in sizes of 30 to 54 in. The bulletin's tables and diagrams give complete specifications and dimensions. **Write or call: National Supply Co., Two Gateway Center, Pittsburgh, Pa., for Bulletin 471.**

●

Laboratory Instruments Catalog 57 covers a line of thermometers and hydrometers. It contains photographs and listings of current A.S.T.M. thermometers and hydrometers and allied testing instruments. **Write or call: Nurnberg Thermometer Co., 124 Livingston Street, Brooklyn 1, N. Y., for Catalog 57.**

Look to COOK for Better Rings!

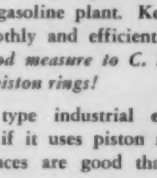


Cook packing and rings help keep compressors humming!

A well-known oil-producing company keeps this big lineup of Clark Bros. compressors running night and day in a West Texas gasoline plant. Keeps them running smoothly and efficiently, too — *thanks in good measure to C. Lee Cook packing and piston rings!*

Whatever type industrial equipment you operate, if it uses piston rings and packing, chances are good that it was Cook-equipped *when it was built.* That's why your best bet for continued trouble-free performance is to *keep it Cook-equipped!*

Your nearby C. Lee Cook representative will be glad to give you all the facts about precision-engineered Cook products. Why not talk with him soon? C. Lee Cook Company, 934 South 8th Street, Louisville 3, Kentucky.



C. LEE COOK COMPANY

A Subsidiary of Dover Corporation

Rings and Packings Since 1888

EQUIPMENT MEN . . . in the News

BJ Service Opens New Station in Monahans, Tex.

W. T. Box, vice president in charge of operations, BJ Service, Inc., reports that a new company station was recently opened in Monahans, Tex. This new station, under the supervision of Werner Hartman, offers complete cementing services. Its facilities include a new bulk plant, and its equipment fleet includes some of the latest BJ Service high-pressure, high-volume cementing units.

Box stressed that the new Monahans station is part of an expansion program designed to provide additional facilities for faster and more efficient service.

Pipeliners See Polyken Film, Plaque Presentation

Members of the Houston Pipeliners Club recently viewed the premier showing of a new film, "On the Line," presented by the Polyken Sales Division of The Kendall Co. The film gives a documentary report of the American Louisiana Pipe Line Co.'s 122-mile, 22-in., Defiance, Ohio, to Bridgman, Mich., pipeline installation, the first in which the Polyken protective tape coating method was used on big inch work.

The meeting was also the scene of a plaque presentation to Houston Contracting Co., one of the contractors responsible for this construction. Presentation was made by H. D. Segool, merchandise manager of Polyken. R. P. Gregory accepted for Houston Contracting Co.

H. C. Price Co., which worked in joint venture with Houston Contracting on this job, has likewise been presented with a similar plaque recognizing its pioneering achievement.

H. D. Segool presents plaque to R. P. Gregory.

C F & I Is Host to Tuboscope Sales Staff

Members of the north zone sales staff of Tuboscope Co. were hosted by Colorado Fuel & Iron Co. at the zone's recent sales meeting in Colorado Springs. Shown are: Harry Wistrand and Kenneth Graham of CF&I; Wayne Clark, Tuboscope's Rocky Mountain division manager; Harold Newton, CF&I; Dick Feemster, sales, Oklahoma; Charles Kromer, sales, West Texas; W. A. Fox, Oklahoma division manager; Frank Winchester, West Texas division manager; A. B. Roop, north zone manager, Oklahoma; Earl McBride, sales, Oklahoma; Bert Deem, sales, Kansas; Len Goulet, sales, Canada; B. H. Pickard, vice president and general manager, Houston headquarters; Wayne Thompson, sales, West Texas; Truman Dillman, Canada division manager; and J. W. McDaniel, sales, Oklahoma.

Hillmac Corp. Appoints Three District Managers

Giles (Bud) Acker, Jr., Coulter Young, and Kenneth Brock have been appointed district managers by Hillmac Corp., diamond coring specialists, Midland, Tex. Acker is district manager of the El Dorado, Ark., area, Shreveport division. Young is district manager for Wichita Falls, newly formed district of Hillmac's Oklahoma division. The Tyler, Tex., district has promoted Brock, formerly of the Midland office, to district manager of the Tyler area. He will be working under the Shreveport division headed by Jack Taylor.

Acker spent 3 years with Southeastern Drilling Co. in Odessa and then worked as a coring engineer for several years before joining Hillmac in its Abilene district.

Crose Acquires Cinch, Opens Winnipeg Branch

M. J. Crose Manufacturing Co., Tulsa, has purchased the complete facilities of Cinch Pipe Bending Co. of Houston, it has been announced by D. M. Curran, Crose president.

Crose takes over the Cinch plant, which has been designated the Cinch Division of M. J. Crose, and Crose's divisional headquarters in Houston. Ben C. Montgomery continues as division manager.

In a move to expand pipeline-equipment distribution and service facilities in Canada, the firm's subsidiary, Crose-Curran, Ltd., has opened a new branch office in Winnipeg, Man.

Under the supervision of J. W. Brand, Crose-Curran vice president headquartered at Edmonton, Alta., the new Winnipeg outlet will be managed by Hugh Trussell.

Graver Tank Directors Elect Gosselin, Swanson

E. N. GOSSELIN

J. E. SWANSON

The directors of Graver Tank & Manufacturing Co., Inc., have elected E. N. Gosselin chairman of the board and J. E. Swanson president.

Gosselin has been president of Graver since 1930. Under his direction, the company has grown from a single plant to a five-plant operation, with nation-wide services in steel and alloy fabrication and erection. Swanson started as foreman in the East Chicago plant and has served in the shops and in sales and management. He has been executive vice president since 1948.

These appointments also cover Graver's two divisions—water conditioning and oil-field equipment—and its subsidiary, Graver Construction Co., Inc.

Texas Iron Works Makes Plant Appointments

Lubie Redmon has been appointed manager of Texas Iron Works' plant at Corpus Christi, Tex. He will be assisted by John Reed. Replacing Redmon at the Victoria, Tex., plant is William L. Baxter. Baxter will be assisted by Ed (Doc) Schroeder.

Redmon has been with Texas Iron Works since 1934 and has served as a machinist, rig mechanic, and shop foreman. In 1951 he became shop manager of the Victoria shop and served as such until his transfer to Corpus Christi. Reed has been with the firm as a field sales and service representative since 1948. Baxter has been with Texas Iron Works since 1937 and has served as machinist, rig mechanic and assistant shop manager of the Victoria shop. Schroeder has been with the company as a field sales and service representative since 1939.

Broggini Named President Of Badger Manufacturing

A. J. BROGGINI

A. J. Broggini has been named president of Badger Manufacturing Co., Cambridge, Mass. He succeeds George C. Hargrove who is retiring from active service. Hargrove will, however, be available for consultation.

In addition to his new duties, Broggini will continue as chairman of the executive committee. He is also a member of the company's board of directors.

Besides its Cambridge offices, Badger Manufacturing also has offices in New York and Houston, and has recently joined with Comprimo N. V. to establish Badger-Comprimo N. V. in The Hague and Badger-Comprimo (Belgium) S. A. Broggini is a director of these subsidiaries.

Frank Wheatley Supply Opens New Dallas Branch

Huber Dye, manager of Frank Wheatley Supply Co. of Tulsa, has announced the opening of a branch office in Dallas. Located in the Fidelity Union Life Building, the operation of the new office will be in the hands of Dan C. Smartt. He was transferred to Dallas from Oklahoma City.

The Dallas branch is the fifth branch office for Frank Wheatley Supply, others being located in Houston, Shreveport, Odessa, and Bartlesville, Okla. Dye said all of the company's major lines would be available through the Dallas office.

Lee Describes Near East Trip for Houston Nomads

Visitors attending a recent meeting of the Houston Chapter of Nomads were: Steve R. Pounds, Trinidad Oilfield Service, Trinidad, B.W.I.; Martin Mears, superintendent, STA, Turkey; Martin Newell, Tidewater Oil Co., Los Angeles; Virgil Lee, Houston; R. L. (Red) Foster, Socony-Mobil Oil Co., New York; J. C. Robbins, Iran Oil Co., Teheran, Iran.

Virgil Lee, the speaker of the evening, discussed his recent trip to the Near East, illustrating it by means of slides taken in Ethiopia.

Sales, Market Research Posts Filled by Wolverine

A. R. KASPARK

Albert R. Kaspark has been appointed manager of technical sales, and James C. Cameron has been named to fill the newly created post of manager of market research, according to J. M. Dumser, director of sales for Wolverine Tube, division of Calumet & Hecla, Inc. Howard J. Luetzow has been appointed technical sales representative in Chicago and surrounding areas, it has been announced by E. J. Campbell, Midwest district sales manager.

Kaspark and Cameron will headquarter at Wolverine's general sales offices in Detroit. Luetzow will headquarter in Wolverine's Evanston, Ill., office.

Kaspark has served in various sales capacities with Wolverine for the past 18 years, his most recent assignment as manager of steel sales. Cameron previously was with the management consultant firm of J. D. Woods & Gordon, Ltd. Formerly technical office sales representative in Wolverine's general sales office, Detroit, Luetzow will contact petroleum, petrochemical and chemical companies plus heat-exchanger manufacturers and fabricators.

Weco Moves to New Office and Plant Facilities

Well Equipment Manufacturing Corp., Houston, is occupying its new home in the Lumpkin industrial district of Houston. The main plant building is 200 ft. by 320 ft. with a portion of the building being allocated to office space.

The modern office building contains 12,000 sq. ft. of floor space. This new office building and plant more than doubles the size and productive capacity of the former plant.

Well Equipment Manufacturing Corp., division of Chiksan Co., a subsidiary of Food Machinery & Chemical Corp., was organized in Houston 23 years ago.

Axelson Appoints Blodgett As St. Louis Plant Manager

D. D. Blodgett was recently appointed general manager of the St. Louis plant of Axelson Manufacturing Co., division of U. S. Industries, Inc., it has been announced by E. M. Hansen, manager of petroleum equipment.

Blodgett has been with Axelson since

1943 and prior to his assignment at St. Louis was area sales manager, petroleum products, of the Rocky Mountain and Canadian areas. He will manage manufacture of sucker rods for deep-well petroleum pumping.

Plastic Applicators Names Manager of Odessa Plant

R. C. BOOTH

Robert C. Booth will be general manager of Plastic Applicators, Inc.'s new Odessa plant, it has been announced by G. J. Duesterberg, company president. Booth formerly was representative for the company's Houston sales area. Prior to joining Plastic Applicators, Booth was gas and oil production engineer with Shell Oil Co. for 8 years.

Plastic Applicators also operates plants in Houston and Harvey, La.

J&L Appoints Hogan Ass't. District Sales Manager

Thomas M. Hogan has been appointed assistant district sales manager for Jones & Laughlin Steel Corp.'s New Orleans office.

Hogan has been with Jones & Laughlin 20 years. His service includes experience as a metallurgical inspector and investigator, specifications examiner, sales correspondent, a salesman in the New York district sales office, and senior salesman in the Detroit district sales office.

Mohan Joins Milton Roy Sales-Engineering Staff

Alfred E. Mohan has been appointed to the sales-engineering staff of Milton Roy Co., Philadelphia manufacturers of controlled-volume pumps and chemical feed systems.

Mohan will prepare quotations and give sales-engineering assistance to customers in the Midwest including the Chicago, Cleveland, Denver, Indianapolis, Minneapolis, St. Louis, and Tulsa areas.

Geophysical Associates Announces Appointments

Gordon Hess has been appointed executive vice president of Geophysical Associates of Canada, Ltd. Succeeding Hess as chief supervisor is J. H. B. Campbell. A. A. M. VanDijk was appointed supervisor.

Hess has been with the firm since 1950 as chief supervisor of Canadian operations. Campbell has been with the firm since 1951 and VanDijk since 1952.

Kildow, Curtis Named to Northern Mud Sales Posts

Gregg Kildow has been appointed sales manager at Billings, Mont., according to Ernest Howell, president of Northern Mud Co., Inc., Magcobar distributors for Montana, North and South Dakota. Robert W. Curtis has been appointed sales representative by Kildow and will headquarter at Williston, N. D.

Kildow was located at Williston as sales representative and was transferred to the Billings general office of Northern Mud in 1956. Curtis has several years' experience in mud engineering in West Texas, the Louisiana offshore, and the Big Horn basin of Wyoming.

Hughes Moves Western Area Headquarters to Dallas

Headquarters for Hughes Tool Co.'s western region have been moved from Midland to the Vaughn Building, Dallas. Among those who will be located there are E. M. Connor, regional manager; H. C. Rowland, regional engineer; Julien P. Muller, regional special representative; and F. L. Galbreath, regional office manager.

E. M. CONNOR

H. C. ROWLAND

J. P. MULLER

Mobile Drilling Acquires Buda Earth Drill Division

Mobile Drilling, Inc., Indianapolis, drilling-equipment manufacturer, has purchased the Buda Earth Drill Division of Allis-Chalmers Manufacturing Co. Mobile Drilling manufactures a complete line of earth-boring equipment, from lightweight prospecting drill units to large mobile field rigs.

News of the company's expansion came from George E. Dickinson, founder and president, who organized the firm in 1946.

Vapor Recovery Expands Electronics Facilities

To accommodate its expanding electronics department, Vapor Recovery Systems Co., Compton, Calif., is doubling the area of this section and modernizing it. The stock-room capacity is being increased six-fold and equipped to speed up assembly of the many complicated components.

A new laboratory fitted with late-model research and testing equipment has been built. Enlarged executive office and personnel accommodations comprise the balance of the expansion.

FWD Opens Sales and Service Center at Duncan, Okla.

Eight-year-old Georgia Jenkins of Duncan, Okla., prepares to cut the ribbon officially opening Four Wheel Drive Auto Co.'s new branch sales and service center at Duncan. Looking on are James A. Driessen, Clintonville, Wis., executive vice president of Four Wheel Drive; Robert A. Olen, Clintonville, FWD president; L. B. Meaders, president of Halliburton Oil Well Cementing Co. of Duncan; Eldon Head, city commissioner; Mayor Wayne Holden, Duncan; and G. F. DeCoursin, Clintonville, FWD vice president-sales. At left is one of the first FWD trucks, a Model B, built in 1918.

Jet Research Names Vice President-Director

Reginald L. (Robbie) Robinson has been named vice president and technical director of Jet Research Center, Inc., Arlington, Tex., according to Blake M. Caldwell, president. The firm is a jointly owned subsidiary of Welex Jet Services, Inc., of Fort Worth, and Byron Jackson Co. of Los Angeles, and is active in the research and development of shaped charges.

Robinson has been with Jet Research Center since the firm was organized in 1955. Prior to that he was manager of the research section at Welex, a position he had held since 1949.

SSC Moves Twelve to Bolivia and Brazil

Twelve seismic and gravity specialists have been transferred to Bolivian and Brazilian crews of Seismograph Service Corp., according to Gerald H. Westby, president of the geophysical firm.

Michael W. Tyrrell will lead a gravity party of seven men to Bolivia. The six others include John W. Chovin, gravity computer; Frederick W. Doll, Robert S. Plumb, and Robert C. Oberg, gravity surveyors; Clinton W. Brownell, gravity meter operator; and Herbert E. Smith, gravity mechanic.

The five men transferred to the Brazilian crews include Party Chief Anthony J. Kochendorfer; Richard W. Dunbar, observing supervisor; Charles G. Laird, and Philip A. Rehil, observers; and R. W. Ivey, driller.

Weatherford Reassigns Ferguson, Expands Staff

J. M. FERGUSON

James M. Ferguson has been named assistant southern division manager by Weatherford Oil Tool Co. Robert P. Turnbull is a new sales and service engineer in the Houston area. Leon Black is now a sales and service engineer operating out of the Houma, La., district.

Clark W. Haston has been employed by Weatherford in the Odessa, Tex., district as sales and service engineer. A new sales and service engineer in Bakersfield, Calif., is Billy Joe Caro.

Ferguson will headquarter in Corpus Christi. He recently concluded a year's service with Weatherford in the Montana area. He previously was with Compania Shell de Venezuela for 9 years. Turnbull was formerly employed by Quintana Petroleum Corp., and Black by Baker Oil Tools. Haston formerly was with Norwood Drilling Co., and Caro was formerly employed by Reed Roller Bit and Hughes Tool Co. in the Bakersfield area.

Oilwell Names Area Mgr., Production Equipment Sales

The appointment of Robert M. Sherrard as area manager, production equipment sales, for United States Steel Corp.'s Oil Well Supply Division at Casper, Wyo., has been announced by R. L. Armstrong, Rocky Mountain area manager.

Sherrard was employed in 1936 by Oilwell at Casper and has worked for the division at Salem and Clay City, Ill.; as store manager at Mattoon, Ill.; district material supervisor at Olney, Ill., and later district merchandise manager at the same location. In 1954 he was appointed district representative at Casper, the position he held prior to his present appointment.

Johnston Pumps Appoints Higgins and Shrader

FRITZ HIGGINS

Fritz Higgins has been named sales representative for Johnston Pump Co. in the Great Lakes area, and E. R. Shrader succeeds William J. Alexander, former advertising manager, who was recently appointed sales promotion manager of Continental-Emsco Co. in Dallas. Both companies are divisions of The Youngstown Sheet & Tube Co.

Higgins has been a Johnston Pump sales engineer in the southern California-Arizona area for the past 3 years. Shrader joined Johnston last year. Prior experience included service with Ramsey Corp., Pryne Co., and Sutorbilt Co.

Southwest Fabricating Elects Judd as President

Ardon B. Judd has been elected president of Southwest Fabricating & Welding Co. of Houston, a subsidiary of Walworth Co. Fred W. Belz, president of the parent company, becomes chairman of the board of Southwest.

Judd joined Southwest in 1951 and became executive vice president and treasurer in 1956 when Walworth acquired the company. He will continue to serve as treasurer.

T. D. Williamson Appoints Shannon to Northwest Area

D. R. SHANNON

Don R. Shannon of Seattle has been appointed sales representative in Washington and Oregon by T. D. Williamson, Inc., Tulsa manufacturer of engineered piping equipment.

Shannon has had 6 years experience in maintenance control and engineering at Northwest Airlines and Boeing Aircraft Co. At Tulsa he recently completed the factory course on application, operation and maintenance of Williamson equipment.

A. R. Smith Joins Scientific Design

Alfred R. Smith has joined Scientific Design Co., Inc., New York City, as assistant to the vice president, new project development. Smith was formerly assistant to the executive vice president of Chemical Construction Corp. Prior to joining SD, he was a director of Sharples Chemical & Industrial, Ltd., Nassau, Bahamas.

GE Names Mangan to Gas Turbine Sales Post

John L. Mangan has been appointed manager-industry sales for General Electric Co.'s gas turbine department, according to E. G. Naylor, department manager-marketing.

Mangan joined General Electric in 1945. He has worked on the engineering test program, in the turbine division's steam turbine design section, in the division's turbine sales, as turbine specialist for the Mid-States district, and in 1955 was named the gas turbine department's sales manager-industrial sales, retaining that position until this recent appointment.

Mid-States Is Triton, Rockwell Distributor

Mid-States Chemical Co., Mount Vernon, Ill., has recently been named Tri-State distributor for the products of Rhome & Hass Co. Principal interest is in Triton X-100, a wetting agent and bactericide used in water flooding.

Mitchell L. Forrester has been ap-

pointed sales engineer recently and will be headquartered at Salem, Ill. He will service the oil-producing fields in North Central Illinois and Indiana.

Mid-States Meter Co., Inc. has recently been incorporated and has taken over the distributorship of the Rockwell line of meters. Mid-States will carry a complete stock of repair parts and has established a department to repair and service meters at Mount Vernon. Officers of the corporation include Clifford Fore, president, and W. B. (Bill) Porter, vice president and treasurer.

Bethlehem Supply Makes Sales Staff Appointments

JAMES E. CLINE

James E. Cline has been promoted to Bethlehem Supply Co.'s Los Angeles office from Santa Maria where he had been store manager and field representative. Ivan E. Warrington has been promoted to the Los Angeles sales staff from the Los Angeles order department where he has specialized in

WARRINGTON

W. A. KNAPP

pipe and tube sales. W. A. Knapp has been promoted to general sales at Los Angeles where he will specialize in sales to the process industries.

Keith E. Avery, salesman at Long Beach, has been appointed store manager and field representative at Santa Maria, succeeding Cline. R. C. Murphy has succeeded Warrington and is in charge of tubular and pipe sales. B. C. Wages has replaced Knapp at Avenal as store manager and field representative.

B. B. McCann, assistant store manager at Long Beach, is promoted to salesman, replacing Avery. Maurice T. Bonfadini has been promoted to the Los Angeles order department where his duties will primarily consist of handling field store orders.

These new appointments and staff changes were announced by Wendell M. Jones, vice president of Bethlehem Supply.

Mission's Western Division Holds Sales Meeting

Western division sales officials of Mission Manufacturing Co., manufacturer of fluid-end slush-pump parts, met in Odessa recently to review sales plans. Shown are: (back row) John Tayrien, Odessa; Don Prichard, Pampa; O. K. Ryan, Lubbock; Byrom Wehner, Houston headquarters; John Bannister, district manager, Midland; Henry Lee, Midland; Ed Anders, Hobbs, N. M.; Miller Sparks, industrial sales manager, Houston; Jack Hardy, Andrews; Dean Hallum, Odessa; Jack Stewart, assistant sales manager, Houston.

Front row: Red Cadwallader, Bakersfield, Calif.; Ed VanLoozen, Los Angeles; Charles Fryar, Wichita Falls; Allen Robinson, Abilene; Richard White, executive vice president and general manager, Houston; Ted Fullinwider, Domestic sales manager, Houston; and Lloyd Bahr, Hobbs, N. M.

Houston Sales Meet Held By Stewart & Stevenson

Eighty members of the sales staff of Stewart & Stevenson Services, Inc., recently held a meeting at the company's Houston headquarters. Executives participating in the 2-day event included Ross Stewart, chairman of the board, and Joe Manning, general manager.

Two manufacturing companies for which Stewart & Stevenson is distributor were represented. From GM Detroit Diesel were John Campbell, assistant to the general sales manager, Detroit; Eric Sutton, Southwest regional manager; C. J. Davy, Southwest regional zone representative; and Charles Stewart, regional service manager for the Southwest zone.

Representing Chrysler Corp. were D. D. Chene, regional zone manager for the Chrysler marine and industrial-engine division, and Harry Williams, Southwest regional representative, both of Houston.

Stewart & Stevenson personnel who spoke on various activities of the company were Bob Mitchell, engineering; G. B. Shandley, service; Bill McWhirter, parts; H. A. Trotter, generator sets; Bill Collett, irrigation; Tiny Herman and Slim Childress, Rigelectric; and Fred Mitchell, vertical improvements.

B & W Has New Warehouse For New Mexico Area

Distribution of B & W scratchers and centralizers in the New Mexico-Permian basin area is now under the supervision of Wesley Pendleton, field representative.

Complete stocks will be maintained in a new company warehouse at Hobbs, N. M.

Schlumberger Names Four To Sales Engineering Posts

C. C. Bush has been named division sales engineer at Oklahoma City for Schlumberger Well Surveying Corp. F. J. (Jack) Bell has been appointed to the new position as senior sales engineer at San Antonio.

C. G. Griffin has been named sales engineer at Jackson, Miss., and J. A. Masters assumes the same position at Midland, Tex.

R. C. Davis, formerly district manager at Evansville, has been promoted to division engineer at Shreveport.

Cameron Names Reynolds, Hallmark, Uhl, Williams

W. L. REYNOLDS

W. L. Reynolds has been promoted from manager of Cameron Iron Works, Inc.'s Mid-Continent district at Tulsa to a staff assistant to the sales manager in Houston. Radean Hallmark was named district manager replacing Reynolds, while the Mid-Continent district headquarters were moved to Chickasha, Okla.

At the same time Roy Uhl was named manager of the Tulsa sales office, and Windell Williams has been transferred from Calgary, Canada, to the sales office in Midland, Tex.

Reynolds, who joined Cameron in 1948, has served as district manager since 1953. Prior to that time he was with Magnolia Petroleum Co. 22 years.

Both Hallmark and Uhl will specialize in the sales and service of Cameron's drilling control, valve, and

Statement of Condition

AT THE CLOSE OF BUSINESS MARCH 14, 1957

RESOURCES

Cash and Due from Banks	$52,257,213.86	
U. S. Government Securities	85,488,075.53	
Other Bonds and Warrants	15,141,288.02	$152,886,577.41
Loans and Discounts		82,460,989.54
Income Receivable Accrued		648,436.24
Stock in Federal Reserve Bank		330,000.00
Bank Premises		4,000,000.00
Customers' Liability Under Letters of Credit		299,400.48
TOTAL		$240,625,403.67

LIABILITIES

Deposits		$221,725,209.98
Letters of Credit Outstanding		299,400.48
Income Collected, Not Earned		253,024.84
Reserve for Taxes, Interest, Etc.		1,334,768.93
Capital—Common	$ 5,000,000.00	
Surplus	6,000,000.00	
Undivided Profits and Reserves	6,012,999.44	17,012,999.44
TOTAL		$240,625,403.67

E. I. HANLON
Chairman of the Board

A. E. BRADSHAW
Vice Chr. of Board and Chief Executive Officer

W. A. BROWNLEE
President

FALKNER C. BROACH
Executive Vice-President

FRANK M. SOWLE
Senior Vice-President

MARVIN MILLARD
Senior Vice-President

E. L. STUCKER
Senior Vice-President

NATIONAL BANK OF TULSA
THE OIL BANK OF AMERICA
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

OKLAHOMA'S 50TH ANNIVERSARY

christmas tree products. Williams has been on the Cameron sales force in Canada for the past 3 years. He specializes in sales engineering on blowout preventers, mud valves, high-pressure drilling controls and christmas trees.

Fluor Promotes Tathwell, Crawford to New Posts

The promotion of J. L. Tathwell and F. G. Crawford to the newly created position of manager of projects has been announced by Fluor Corp., Ltd. The new posts were created to strengthen the management direction of Fluor projects. All present and future active contracts will be assigned to a manager of projects for over-all management and coordination.

J. L. TATHWELL

F. G. CRAWFORD

Fluid Packed Pump Names Miller to Eastern Post

BENNY MILLER

The appointment of Benny Miller as assistant division manager of the eastern division with headquarters at Olney, Ill., has been announced by D. H. Vanderburg, sales manager of Fluid Packed Pump Co. Miller has been a Fluid Packed Pump salesman for 6 years.

Republic's New Pipe Dept. Offers Special Services

Republic Supply Co. of California has announced a new pipe department with a program of special services which includes consultation with buyers on pipe specifications, coating and wrapping, cement lining service, cutting and threading, and grooving for Victaulic coupling. The new department is under the direction of J. G. (Andy) Anderson assisted by Paul Richards and Larry Canaan.

According to Roy W. Johnson, executive vice president for the firm, this special department has been organized to handle the company's growing volume of sales in steel, aluminum and plastic pipe for industrial and oil-country uses.

B-I-F Industries Appoints Harris as Sales Engineer

Walter A. Harris has been transferred from B-I-F Industries of Canada, Ltd., to the home office of B-I-F Industries, Inc., in Providence, R. I. Here he is sales engineer on Synchro-Scan supervisory control systems manufactured by Builders-Providence, Inc., for remote operation and supervision of valves, pumps, liquid levels, and other functions.

Harris' previous experience includes supervisory duties in filtration plants, sales and service engineering experience.

BS&B Names Managers of Two New Sales Divisions

G. C. SMALE

BOB CONN

D. P. SMITH

HOUGESTOL

George C. Smale has been appointed manager of the Saskatchewan division of Black, Sivalls & Bryson, Ltd., and Bob Conn has been named manager of the Alberta division. These appointments were announced by Paul Bartley, general manager of BS&B.

The Saskatchewan division includes the provinces of Saskatchewan and Manitoba. Headquarters have been established at Regina. The provinces of Alberta and British Columbia comprise the Alberta division. Headquarters are at Edmonton.

In addition to creation of the new divisions, the Alberta division has been divided into two districts. Delbert P. Smith has been promoted to manager of the Calgary district and Gordon Hougestol to manager of the Edmonton district. Headquarters have been established at the respective cities.

This announcement does not constitute an offering. The offering is made only by the Prospectus, which may be obtained from such of the undersigned as are registered dealers in this State.

April 3, 1957

369,600 Shares

Fisher Governor Company

Common Stock
($1 Par Value)

Price $12.50 per share

Glore, Forgan & Co.

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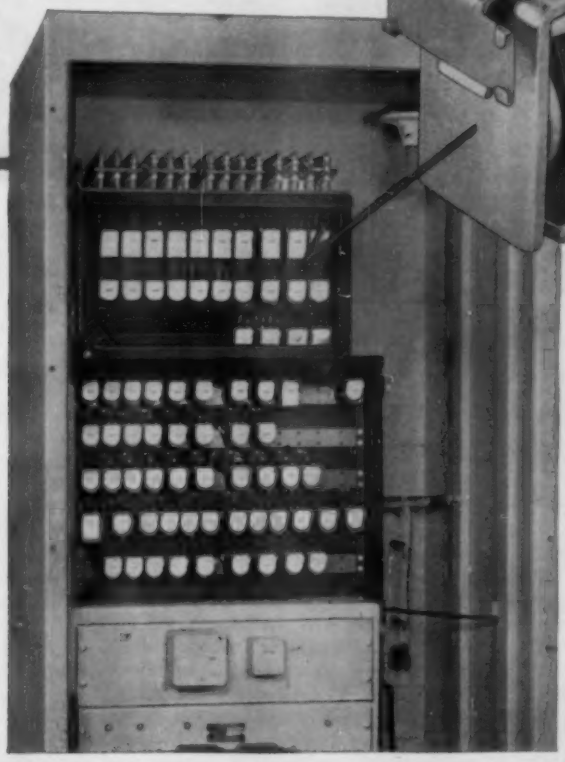

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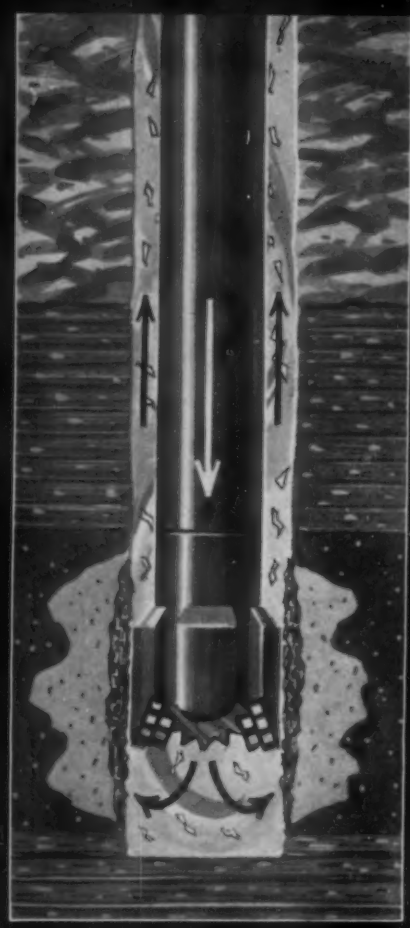

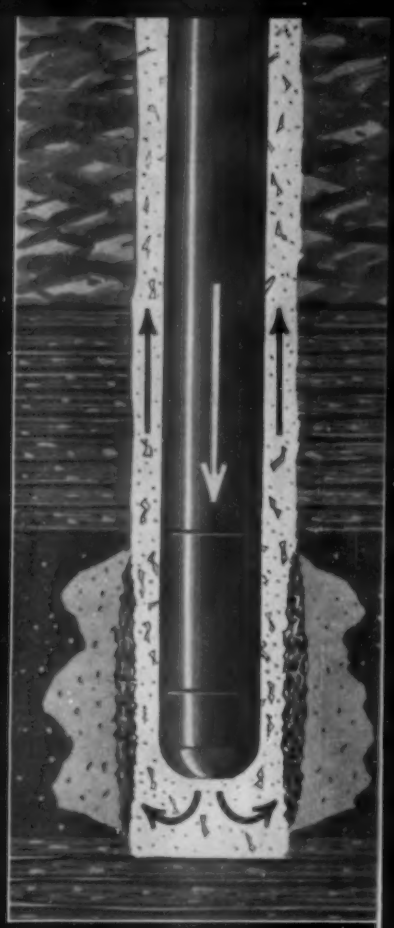

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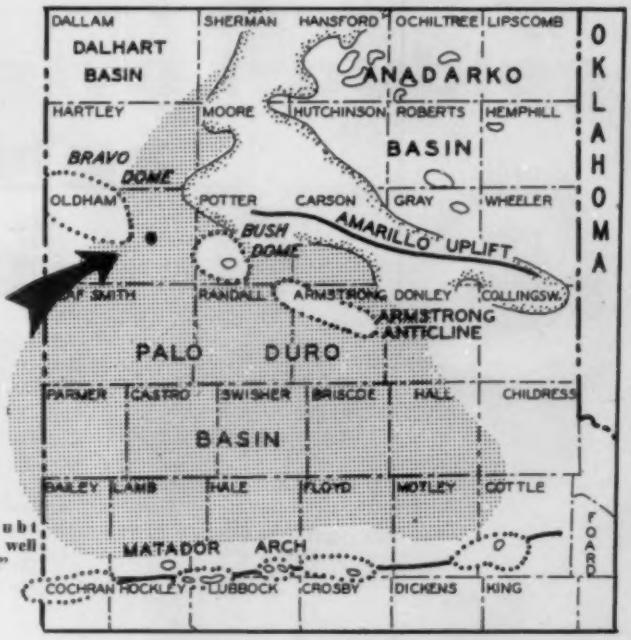

"There's little doubt they've got an oil well —and a good one."

Dear John:

Well, old buddy, it's been just a year since I last wrote you. I told you then about the good hunting grounds out in the Palo Duro basin of the Texas Panhandle, and I was glad to hear that you had latched on to a bunch of acreage there. You'll be glad, too, when you hear the news.

Shell Oil Co. has just come up with the first promise of real oil production in the vast basin. At its 1 Alamosa Ranch, a 1-hour drill-stem test of the Pennsylvanian lime at 6,096-6,130 ft., recovered 4,000 ft. of clean 40°-gravity oil and 500 ft. of heavily oil-cut mud. Following that, the company cored ahead, lost circulation, regained it, and now they'll go on down to granite at around 7,000 ft. There's little doubt they've got an oil well, and a good one.

This wildcat is in Oldham County, John, on the west side of the basin, in Section 41, League 310 of the Capitol Lands Survey, Block H-3. I'm enclosing a copy of the map I sent you last year with the location of the new strike spotted on it. You'll notice that it's in a channel connecting Palo Duro and Dalhart basins and on the east flank of the Bravo dome uplift. The nearest oil production is at Rehm field, the discovery that opened up the Dalhart basin for the first time in 1956. Rehm is about 35 miles north of Shell's well. To the south, there "ain't nuttin' " until you come to the Pennsylvanian fields on the Matador arch.

There's an interesting tale behind this discovery. Exactly 29 years ago, in April 1928, the old Prairie Oil Co. abandoned its 1 Levinger only a half mile north, in Section 46. This was a deep test for the time, and it was drilled with cable tools to 5,645 ft. If they'd gone on down only 500 ft. more, they probably would have opened this field then! The machinery they used is still on the location . . . and what a location. It's on a high promontory, typical of the rugged Palo Duro country, and as one Shell man says, "At night, you could probably break a leg by stepping out in any direction." Oldham County is traversed by the Canadian River from west to east, you know, and dozens of small streams flowing northward into it have cut many a small canyon into the surface. The seismic boys can tell you how rugged it really is; Shell couldn't even complete one of its surveys because of the topography.

But even more interesting than the Prairie well is the story behind the current strike, John.

It's on a big surface structure. Charles N. Gould, one of the country's finest early-day rockhounds, mapped it and wrote a report on it in 1919, and it was on the basis of his report that Prairie drilled its well in 1928. Well, Shell dug out this dusty tome and had one of its own geologists run a check on it. It checked. Meanwhile, Shell had been dickering to lease the LS Ranch, just to the east of the Alamosa. The landowner said no shooting before leasing, so Shell leased without shooting. That figures, doesn't it? Then the company made a checkerboard farmout deal with Hunt Oil Co. for acreage on Alamosa Ranch, and put its seismic crews to work on both ranches. The wrinkle-chasers found that the surface structure carried on down through the section, and Shell decided to drill. Simple? Maybe, but it goes to show you what an aggressive oil hunter can do if he has a few facts and figures, some old reports, and lots of imagination.

I still say **there's lots of undiscovered oil in Palo Duro basin.** As I told you last year, it's got everything that the oil-field recipe calls for. There are 32,000 sq. miles of lonesome hunting ground, and a drilling density of less than 1 wildcat per 100 sq. miles. More than 11,000 ft. of Permian and Pennsylvanian sediments was deposited by the same seas that covered the Permian and Delaware basins. There are structures all around the basin flank, and nobody really knows how many in the deeper part, just north of the Matador arch.

If you remember last year's letter, you'll recall that I said, "Some day, some fool is going to bring in a well in Palo Duro; then all the other fools will jump in behind him and swear they knew it all along." The Shell company is **nobody's** fool, John. They find oil, and this strike is just one more tribute to one of the most aggressive, imaginative wildcattin' outfits I know. Remember South Dakota? Nevada? Arizona? And, oh yes, the Paradox basin?

So hang on to your Palo Duro acreage, boy. It'll be worth the rentals some day. Just remember the Alamosa!

Yours for good hoping.

Frank J. Gardner.

ORIGINAL ROCK	PRIMARY POROSITY	SECONDARY POROSITY	
		BY GROUND WATER	BY CIRCULATING WATER
LIMESTONE	Intergranular and possibly intercrystalline (Reefs = voids in skeletal structure etc.)	Leaching of more soluble constituents or more permeable zones by acid charged water. E.g. = reconstitution of channels of primary porosity or extension of porosity along fractures.	Solution and leaching as with ground water Dolomitization Solution and recrystallization.
DOLOMITE	Intergranular and possibly intercrystalline	Leaching of the more soluble elements as in case of limestone above. Leaching of zones of random oriented crystals.	Solution and leaching as in case of ground water
MIXED ROCK	Intergranular and possibly intercrystalline	Leaching of the more soluble calcite crystals Leaching of the more soluble random oriented dolomite crystals.	Solution and leaching as in case of ground water.

OUTLINE of the genesis of porosity in carbonates. Fig. 1.

Let's revive our interest in . . .

LIMESTONE RESERVOIRS

by W. J. Burgess

AN article concerned with methods of exploring for new petroleum reserves in carbonate rocks should begin with a brief review of what is known of the nature of carbonate rocks, particularly as regards the development of porosity and permeability. In fact, trapping situations in carbonate rocks are often more intimately associated with porosity than in the case of sandstones. Closure, for example, is obtained by a lateral porosity or permeability change in a carbonate reservoir more often than in a sandstone reservoir.

The author is senior geologist with Sinclair Oil & Gas Co., Tulsa. This article presented at the fifth Biennial Symposium on Subsurface Geology, University of Oklahoma, March 13, 1957.

Primary porosity . . . Why is a limestone porous? Is it porous for the same reason a sandstone is porous? The porous character of a sandstone is nearly always due to primary intergranular porosity; this is the nature of a clastic rock. But it has been fairly well established in recent years that limestones, too, are for the most part clastic rocks, i.e., made up of shell fragments, oolites, organic debris of sand size or calcarenites, calcareous muds or calcilutites, and so forth.

Although reefs as such could not be included among the clastic rocks, the biostromal deposits might very well be considered clastic in origin. Therefore, we might expect at first thought that porosity in limestones should be not unlike the porosity of quartzose sandstones, i.e. intergranular in character. However, with the exception of reef type of limestones, primary porosity in carbonate rocks is very often an

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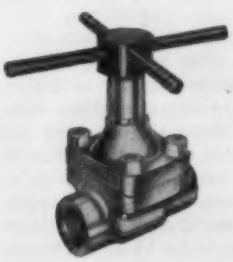

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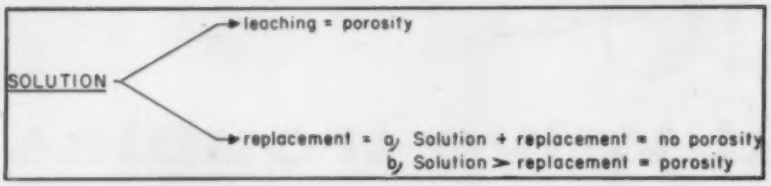


PROCESS OF SOLUTION can go in two directions. Fig. 2.

ephemeral thing. The fragments or grains involved are composed of readily soluble material, calcite, dolomite, or aragonite, which at the first opportunity might be affected by solution and recrystallization with a consequent reduction of porosity. Often the original clastic character of the sediment is obliterated so that it truly becomes a crystalline rock, although enough original porosity might remain, at least in zones, to afford entrance for circulating groundwaters later on. Complete retention for very long of so-called primary porosity and permeability in most carbonate rocks is rare. The answer to the question as to why a limestone is porous—when it is porous—will be found chiefly in the phenomenon called secondary porosity.

Secondary porosity . . . Fig. 1 represents an outline of the genesis of porosity in carbonates. Secondary porosity is developed in carbonate rocks by the action of circulating or ground waters through the rocks. The physical composition and vicissitudes of movement of the circulating waters are extremely important in the way porosity and permeability is developed. For example, water charged with humic and carbonic acids derived from soil and atmosphere will render a carbonate rock porous simply by dissolving the more soluble constituents—perhaps by following zones of residual original porosity. In the case of a pure dolomite or pure limestone, as noted on the chart, leaching will occur in the more soluble zones, causing vugular or channel porosity as the material leached is removed and perhaps redeposited elsewhere.

A rock made up of a mixture of calcium carbonate and magnesium carbonate will also be made permeable by the selective solution and removal of the more soluble elements. Here, however, as shown on the chart, is an apparent contradiction concerning the effects of solution on mixed carbonates. For a long time it was believed that since calcite is more soluble in acid than dolomite the calcite is removed from a mixed rock under the action of solution by circulating waters.

However, certain work (Bruno Sander, 1936; Richard Hohlt, 1949; and others) shows that in many cases the dolomite is removed rather than the calcite. This has been attributed to the random - orientation characteristics of the c-axis of the crystals in most dolomites.

These workers maintain that ground and circulating waters can permeate more easily through randomly oriented material than through material with a high degree of preferred orientation such as calcite.

Again, if the circulating waters have a high magnesium content a process of solution and recrystallization—or dolomitization—may occur in which a limestone becomes soluble and permeable provided always that solution progresses faster than recrystallation.

Kenneth Landes (1946) put forward this thesis, viz., that local dolomitization porosity results from an excess of solution over precipitation during the process of replacement of limestone by circulating ground waters.

The process of solution can go in two directions (see Fig. 2). It can cause a carbonate rock to be leached. Some of the more soluble elements, if attacked by unsaturated acidic waters, will go into solution and be carried elsewhere. This leads to porosity of course, usually vugular or channel type. If the waters contain magnesium carbonate, two things can happen: (1) the calcite of the limestone which is undergoing solution can be replaced by dolomite on a volume to volume basis, i.e., as each portion of the limestone is dissolved it is replaced by an equal amount of dolomite so that no porosity will result and the rock will become nonporous dolomite; (2) if circulation is very active so that solution takes place more rapidly than replacement a porous rock will be the result. This in effect is a leaching process and could lead to good vugular or channel type of permeability.

But how does secondary porosity actually develop? In order for the circulating waters to begin working on a carbonate rock there must be some porosity present. There must be some means for the waters to gain a toe hold. This could be in the nature of zones of residual porosity. Perhaps uplift and prolonged subaerial erosion and weathering might begin the process with circulating waters completing the job after the beds are buried once more. Deformation of rocks in times of folding or even during the process

"Limestones or dolomites which have become porous can later become nonporous as the pore spaces are filled with secondary deposits. There may be a number of cycles wherein a rock vacillates from porous to nonporous conditons."

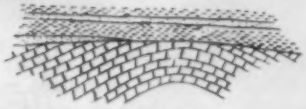
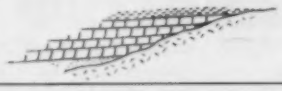
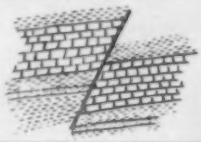
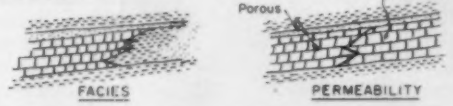
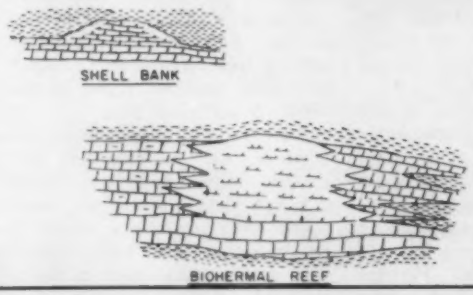
of diagenesis may cause fracturing to develop, which will allow circulating waters to enter. It appears that porosity in carbonate rocks is often local in origin, i.e., is more likely to occur where circulating waters were allowed access to the rocks because of some local condition. It is necessary to have knowledge of the nature of porosity of carbonates in order to discuss adequately the matter of trapping conditions in these rocks. Structure as well as porosity is generally a local problem.

Limestones or dolomites which have become porous can later become nonporous as the pore spaces are filled with secondary deposits. There may be a number of cycles wherein a rock vacillates from porous to nonporous conditions. Vugs, fractures, and so forth, can just as easily become filled as not, depending on changing conditions of the circulating waters. Therefore, the matter of predicting areas where carbonates will have adequate porosity and permeability is full of uncertainties.

However, with knowledge of the geologic history and stratigraphy of an area the geologist can make a good guess as to conditions of porosity which might be anticipated. For example, if he knows where an unconformity may be present above a carbonate sequence, he might expect porosity to have developed through subaerial leaching. A knowledge of the time and nature of orogenic movements may indicate where he might expect to find fractured beds with consequent porosity. But here we are getting into the matter of trapping conditions and we ought to touch on one more thing before going on in this subject. Another question comes to mind. How does the oil get into the carbonate reservoir?

Migration . . . Very likely oil and gas enters a carbonate reservoir in one of two ways: (1) by migrating from some distant source through widespread and readily permeable sandstone, or carrier beds; (2) by being squeezed out of associated shales during compaction. The latter means is probably the more common because the local source for

CLASSIFICATION OF TRAPS FOR CARBONATE RESERVOIRS

TRAPS	ORIGIN OF POROSITY ANTICIPATED	PROB. SOURCE OF OIL
I ANTICLINE	Fractures and joints caused by folding and consequent solution cavities from circulating waters.	From distant source through carrier bed or from local shale if present.
II UNCONFORMITY 	Vugular channel, solution cavities and possibly intercrystalline caused by subareal weathering and leaching.	From overlying shales or brought in by carrier bed (ss) overlying the truncated limestone.
III ONLAP (?) 	Vugular, channel, etc. caused by solution from circulating water.	From associated shales or brought in by porous carrier bed.
IV FAULT 	Vugular, channel, etc. and fracture, caused by solution by circulating waters brought in along fault zones.	From associated shales or brought into reservoir via fault zone.
V POROSITY 	Vugular, channel, etc. caused by circulating waters.	From associated shales or introduced via carrier bed.
VI REEF 	Original voids and cavities increased by possible subareal leaching and solution by ground and circulating waters. Very susceptible to secondary dolomitization.	From associated shales lateral to, and above, the reefal mass.

W.J. Burgess 1957

CLASSIFICATION of carbonate reservoirs according to type of trapping conditions under which they may be found. Fig. 3.

petroleum, shales, especially the dark carbonaceous shales, is almost always very closely associated with carbonate reservoirs.

Carbonate traps . . . After gaining a knowledge of the nature of porosity and permeability of carbonate rocks, and after being reasonably certain as to the source of oil in such reservoirs, we are in a better position to begin the actual search for potential traps.

The greatest single method which can be used in the search for reservoir rocks is a thorough analysis of geologic history and stratigraphy. This is called a single method although it would be more truthful to call it a synthesis of methods. A thorough knowledge of geologic history is gained from information taken from subsurface sample and electric log control, seismic data, and surface work. But when we finally arrive at a knowledge of the geologic history of an area we are then able to answer a number of pertinent questions.

For example, are there reefs to be expected in the area? Are there unconformities present in the section? If so, where? What is the nature of the folds? Might we expect fractures or faults to be developed? In other words a knowledge of geologic history, tectonics, and stratigraphy ought to tell us where we can go to find favorable traps and porosities.

Fig. 3 classifies carbonate reservoirs according to type of trapping conditions under which they may be found. In addition the possible origin of porosity which might be expected in each type of trap, as well as the probable source of oil or gas is noted.

Anticlines . . . The first figure on the chart shows the classical anticlinal trap. Circulating acidic waters might attack a carbonate via associated porous beds, such as sandstones. Fractures and joints formed when the beds were folded might increase the area of access. The process of solution and recrystallization may take place if the host rock is limestone and circulating

waters are magnesium bearing. The source of oil in such a trap could be some distance away if a porous bed is nearby to act as a carrier. If shales, particularly dark carbonaceous shales, are closely associated with the limestone, oil or gas could be squeezed out through compaction and introduced into the reservoir bed.

The usual methods of outlining anticlines by surface, subsurface, and seismic information will do the job in the matter of finding this type of trap. An example of an anticlinal trap in a carbonate would be Lyons gas field in Rice County, Kansas, where gas production is obtained from a fold in the Arbuckle dolomite. The so-called Northern Fields of Mexico also produce from anticlinal folds.

Unconformities . . . Next we have an example of an unconformity trap. This is probably a fairly common type of carbonate trap. The situation for the development of porosity is ideal. Uplift, erosion, and subaerial leaching will form solution cavities, vugs, etc. If reburial, then, is relatively rapid this secondary porosity may be retained, and later on hydrocarbons may be brought in by way of overlying porous beds or even squeezed out of interbedded or overlying shales. Oklahoma City field could exemplify this type of trap for here a fold in the pre-Pennsylvanian beds has exposed Arbuckle to erosion and then truncation by the Pennsylvanian sediments. A knowledge of geological history, as mentioned before, would enable a geologist to anticipate a trap such as this.

The examination of well samples, where available, is the surest way of discovering the existence of an unconformity in the subsurface. A single sample log with accurate age determinations will tell you immediately whether or not the well has crossed a hiatus or unconformity. Correlation with electric logs will also reveal an unconformity but not nearly so dramatically nor so accurately as sample work. Seismic profiles can show the presence of an unconformity in a very striking manner by a phenomenon of convergence of dips wherein a lower series of dips can be seen to be truncated by an overlying datum. This can be observed quite often in southern Oklahoma at the pre-Atoka unconformity.

Onlap . . . The next type of trap listed here may actually be a very unlikely one. Although hydrocarbons very often are produced from sandstones which exhibit onlap relationships, bedded carbonates may not exist in this structural position. Onlap implies the action of a transgressive sea; such action would result in the accumulation of clastic sediments against a buried "hill" or slope. Very probably the presence of carbonate rocks in close association with buried topography would indicate reefal activity. The possibility of onlap trapping in carbonates is noted only because we should be aware that it is a possibility. A clastic limestone sequence, e.g., might be found exhibiting onlap relationships.

Faults . . . Fault traps involving carbonates are probably very common. Circulating waters could be brought into contact with the potential reservoir by way of the fault zone. This type of trapping situation tends to render a limestone very susceptible to dolomitization, for circulating waters which may have become magnesium-bearing by being in close contact with primary dolomites might then migrate to the limestone via the fault zone. This type of trap occurs often in the Great Lakes area where the reservoir rock in many fields is the Trenton limestone. This limestone has been dolomitized and made porous by waters which have come up through deeper (and older) primary dolomites.

The oil and gas present in a trap of this sort would probably also enter the reservoir rock by way of the fault zone which would act as a carrier bed. We must not forget, too, that the fault will have to be sealed somewhere above the reservoir bed to prevent the hydrocarbons from leaking out. Perhaps secondary mineralization will cause part of the fault zone to become nonporous; or further structural complications, more faulting for example, may result in a sealing effect. The presence of faulting in an area can be discovered through the examination of well samples where missing or repeated beds may be detected.

Surface work, too, will reveal whether any section of a formation is missing or repeated. In a seismic profile a fault may be observed by the manner in which a series of dips are offset along a line which will conform to the actual fault plane.

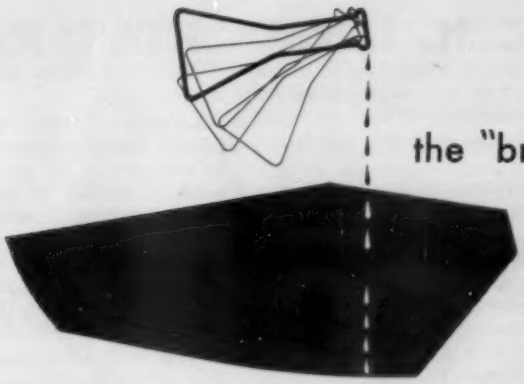
Porosity . . . The porosity trap, which may also de described as updip permeability trap or facies change trap, is probably most common in connection with sandstone reservoirs. Two possibilities have been presented for porosity carbonate traps. The first (see Fig. 3) shows a facies change within a time stratigraphic unit: limestone into shale or mudstone updip. In the case shown, porosity might be created by solution through dolomitization by waters squeezed out of associated shales. Of course if a carrier bed is present then both the circulating waters and the hydrocarbons could be brought in from elsewhere. The second drawing (see Fig. 3) shows an updip permeability trap within a carbonate bed. The porosity here would come about through selective solution by ground or circulating waters.

For example, unsaturated acidic waters might cause solution cavities to progress in a portion of the limestone until they reach the point of saturation in which case redeposition of calcite would take place as fast as solution, the creation of porosity would cease, and the porosity trap illustrated would obtain. A permeability trap of the last type would probably be most difficult to discover unless enough subsurface well control were available to allow one to outline possible zones of porosity within a particular bed.

The trap involving facies change, however, can be searched for with greater success. Sample or electric log data can yield a lithofacies map which would delineate zones where a carbonate facies grades into or interfingers with another facies such as shale. Seismologists, with the use of the relatively new high-frequency method, may be able to record the pinchout or termination of a resistant bed such as a limestone where it grades laterally into a less competent shale. These zones of pinchout or facies change can be plotted on a map and when used in conjunction with structures may reveal excellent trapping saturations.

Reefs . . . We come now to what most people would consider the "piece de resistance" of the matter in hand—the reef. To define the term—a reef might be described as any potentially wave-resistant organic accumulation which has relatively limited lateral extent and, because of this feature, appears in the rocks as a mound-like structure. This local organic accumulation can be in the

"There is still much that we do not know about carbonate reservoirs. Cooperation in the form of an exchange of ideas among all members of the geologic profession is needed to solve the many problems which still face us in regard to finding and extracting petroleum from carbonate rocks."



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form of a buildup of generally nonstratified material made up of such colonial animals as corals and bryozoans or in the form of a shell bank composed chiefly of mollusks and brachiopods. For the petroleum geologist, a reef may be considered to be formed by either biohermal or biostromal activity of organisms. It is true that by definition a biostrome is an organic deposit which does not swell into mound-like form. But it may be possible to have a biostrome or shell bank which will take on definite characteristics of reefs in that there is a local buildup of shell material perhaps even to the point of emergence.

Of course, it might be said that this would not, then, be a biostrome but rather a bioherm, since it now has a mound-like form. This may be true; perhaps we are splitting hairs on the matter of terms. The distinction between bioherm and biostrome is somewhat arbitrary. Knowing possible diversities of origin of organic deposits of this sort is important. It may be, for example, that we can expect to find shell banks in areas where normal biohermal reefs might not be anticipated, although a similar type of environment should hold for both—warm shallow water.

Anyone who is familiar with carbonate fields or who has examined the literature on the subject will be struck by the number of fields in which the bed overlying the carbonate reservoir appears to thin considerably in the middle portion of the structure. This phenomenon has been attributed to the presence of minor indetectable unconformities or, at times, to differential compaction over a structure. This may be true for some fields of this type. In many cases, however, the thinning effect may actually be the result of a biostromal buildup which took place while the carbonate bed was being deposited.

The so-called overlying bed (which, interestingly enough, is often a shale) is really part of the same sedimentary cycle and, indeed, the same time stratigraphic unit as the carbonate. While the organic carbonate was being deposited in a reef-like manner within a limited area the flanks of this buildup were receiving muds. The structure involved here could actually be created by the buildup so that no folding is necessary to obtain the "anticline" which is often attributed to this type of field.

The porosity which might be expected in such a trap as this may be partly primary in the event that buildup has progressed to such an extent as to permit subaerial erosion and leaching to take place. Very possibly, however, buildup would not progress to this point and true secondary porosity, solution or solution and recrystallization, or dolomitization, would have to do the job. A very rich local source of oil for a carbonate reservoir of this sort would be found in the overlying and lateral shales.

The true biohermal reef is composed generally of nonstratified organic material and includes large numbers of such colonial animals as corals and bryozoans. The organisms responsible for the reef will be for the most part sediment binding, which in turn will make the structure wave resistant. Emergent conditions may then easily follow.

There is a chance that original or primary porosity may be retained to a very large extent. The organisms which make up reefs create structures which tend to develop natural voids as the reef grows and the older animals of the complex die off. Further winnowing by wave action will help to increase such porosity. If the biohermal mass is raised above sea level, porosity through subaerial weathering and leaching might develop. This is secondary porosity even though the complex is not yet buried.

In exploring for reefs it is most important to be aware of the type of environment in which reefs are likely to develop. Although they may develop over isolated offshore shallows the common place for a reef to grow is on the seaward edge of a shallow clear water shelf or on the fringe areas between a platform and a basin. The recognition of the reef in the subsurface is extremely important, of course.

In areas where there is some well control the nonbedded nature of a reefal body might be detected from the examination of electric logs, but the best and most accurate method for discovering the presence of bioherms is the examination of well samples. A study of the lithology and paleontology of a well in an area where reefs might be expected will inform a geologist of the position the well occupies in relation to the reef. He may know, for example, whether the well has penetrated the reef, the forereef area or basin, or the backreef or lagoonal area, for distinctive lithologies and fauna are associated with each of the environments.

The reefal environment will be characterized by the presence of colonial animals such as corals and bryozoans. The lithology will often be dolomite which is a result of secondary dolomitization of the porous reef complex. The backreef or lagoonal lithology would consist of bedded limestones, mudstones, and especially in the case of a regressive sea, evaporites. The forereef or basinal areas might be marked by a benthonic fauna such as brachiopods and crinoids, and a lithology of dark carbonaceous shales or bedded limestones.

Limestone sand, or calcarenites (usually sucrosic dolomite), would also be common in the forereef area as a result of erosion of part of the reef where subareal weathering has occurred. If we are able to ascertain where a well or two may be located with respect to these environmental factors, we will be in a position actually to point in the direction of the reef.

Since reefs are reflected in the structure of overlying sediments, usually as anticlines, seismic work can be very effective in the detection of this type of trap. In addition, a seismic profile which shows a rather sharp convergence of reflection horizons could indicate to an alert geologist or geophysicist an approach towards a shelf area and favorable reef environment.

Surface work too can make excellent contributions in the matter of exploring for reefs. The anticlinal reflections of a buried reef can be outlined in the usual manner but the most important values lie in stratigraphic studies. Examination of carbonate rocks in areas of outcrop can reveal much about what to expect to find in the subsurface. Discovery of reefal material, for example, in beds in which such evidence was previously unknown could be a contribution of fundamental importance.

It is easy to recall fields where the reservoir rock is a reef. The Silurian reefs of the Great Lakes area have been reliable producers for years. The West Texas area is still a very active reef production province. But probably the most famous of all reef reservoir fields are the so-called southern fields of the Golden Lane area of Mexico where prolific production is taken not only from the reef proper but also from the flanking calcarenite debris in the basinal areas adjacent to the reef.

Conclusion

There is still much that we do not know about carbonate reservoirs. Cooperation in the form of an exchange of ideas among all members of the geologic profession is needed to solve the many problems which still face us in regard to finding and extracting petroleum from carbonate rocks. The geologist and paleontologist who examine the rocks themselves and interpret the pertinent sedimentary and structural conditions, the geophysicist who determines structure and certain stratigraphic characteristics of the beds, the engineer who studies the nature of fluids and pressures in the rocks—all can contribute to our knowledge of carbonate rocks. **End.**

EXPLORATION HIGHLIGHTS

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ALABAMA

Gas Tests Completed In Black Warrior Discovery

Walter Pearson and associates have completed their gas-discovery well in eastern Marion County. Completion follows a long series of tests, in which the well flowed at rates ranging from 955,000 cu. ft. per day, through ¼-in. choke to 3,600,000 cu. ft. per day, through ⅞-in. choke. Pressure through ¼-in. choke was 650 psi. Tests showed a small amount of water.

The well, 2 First National Bank of Birmingham, gives northwestern Alabama's portion of Black Warrior basin another gas-productive area. It is 14 miles east of Hamilton gas field, in the same county, where three wells have been completed. Production in both areas is from the Mississippian Lewis (Bethel) sand. Pay in the new discovery is perforated opposite three intervals — 1,530-53 ft., 1,554-60 ft., and 1,569-76 ft. Total depth is 1,641 ft.

Location is in 7-11s-11w, just south of Haleys, and about 5½ miles north of Boston.

APPALACHIAN

EASTERN KENTUCKY

In Pike County and located on Right Fork of Peter Creek, United Fuel Gas is drilling at 2,780 ft. on their wildcat 64 Kentland Coal & Coke Co. Mississippian Big lime 2,253 to 2,602 ft. tested 21,000 cu. ft. of gas daily.

OHIO

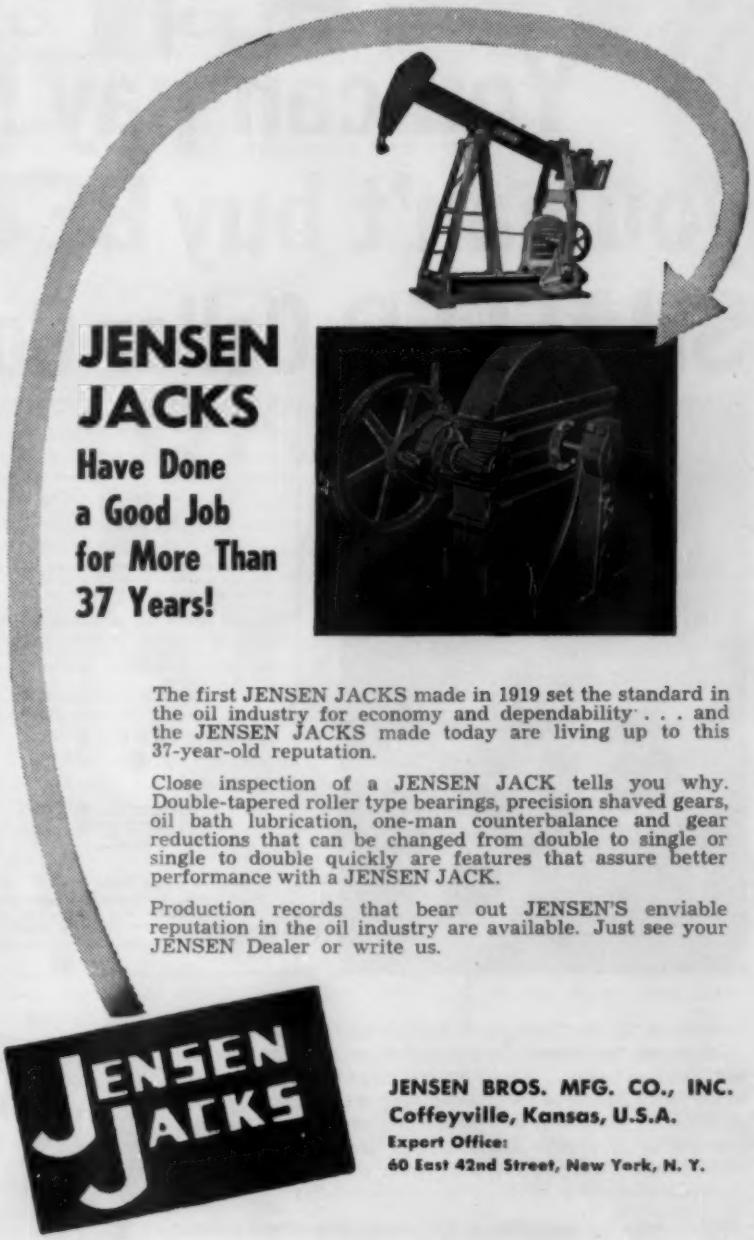
A wildcat gasser was brought in by Pure Oil Co. southeast of Frazeysburg on 1 Esther McNaught, Lot 17, 3rd Qr., Cass Township, Muskingum County. Clinton sand at 3,463-3,512 ft. made 150,000 cu. ft. natural and 625,000 cu. ft. after fracture. In the north part of Licking Township good production is still being found in the Nashport field. Mutual Oil & Gas Co. 2 (6) Genevieve Fairall, 2nd Qr., made a good showing in Clinton at 3,010-3,074 ft. and 185 bbl. in a 24-hour test after fracture.

● A north extension to Millersburg field on 2 Floyd King, Section 9, Prairie Township, Holmes County, gaged 3,000,000 cu. ft. and 10 bbl. in 24 hours after fracture. The completion, by Mickley and Workman, logged the Clinton at 3,204-71 ft.

PENNSYLVANIA

In Gaskill Township, Jefferson County, Southwest Pennsylvania, Columbian Carbon Co., 2-1837 Frank M. Sheesley wildcat, was dry after frac in the chert where a very light show of gas was recorded. The Onondage was reached at 7,345 ft., the chert at 7,358 ft., and total depth 7,460 ft.

● Washington Township, Indiana County, this company has another deep test under way. It is 1844 Silas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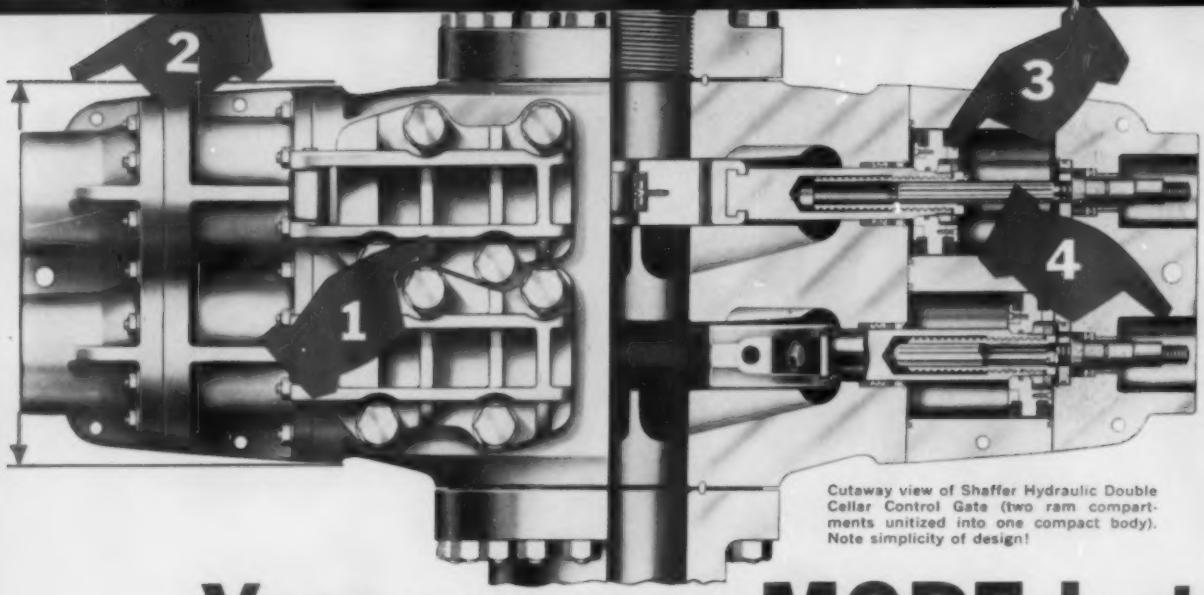

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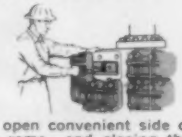

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WEST VIRGINIA

Dry Fork district, Randolph County, West Virginia, Hope Natural Gas Co. 9999 U.S.A., elevation 3,105 ft., reached the chert at 6,362 ft. and is drilling at 6,364 ft.

• In Portland district, Preston County, this company's 10015 Sarah J. Creamer, elevation 2,356 ft., shut down at 5,902 ft. to run and cement 7-in. casing. The chert in this well was 7,901 ft.

CALIFORNIA

Richfield Scores at Midway-Sunset Field

Richfield Oil Corp. gave Midway-Sunset field, Kern County, a new Leutholtz sand discovery with completion of the 4,383 ft. 21 Leutholtz in NW NW 22-11n-23w. This wildcat is on the north edge of the Santiago flank of the field. It was completed flowing 175 bbl. daily of 28.6°-gravity crude from an interval at 4,138-4,203 ft. in the Upper Leutholtz sand.

Union Completed Fourth Stenderup Well

Union Oil Co. of California completed its fourth successful producer in the Stenderup pool activity in the Arvin area of Mountain View field, Kern County. The well, 53-21 UOC-Hancock-Cattani, was brought in pumping 133 bbl. daily of 28.9°-gravity crude from 9,167 ft. Union reports 90-ft. of zone open in the well which is a northeast offset to the discovery.

New Ojai Discovery

W. R. Oil Co. chalked up a new fault block discovery in the Ojai field, Ventura County with a 1,540 ft. wildcat in the Lion Mountain area of the field. The new discovery, 4 Bailey, was completed in a shallow fault trap at 1,172-1,527 ft. for 50 bbl. daily of 20.7°-gravity crude.

New Depth Record Set At Salinas Valley

The Texas Co. was drilling below 11,275 ft. on 1 Shell (NCT-1) in the Mincey Canyon region of Monterey County near San Ardo field. This test sets a new depth record for drilling in Salinas Valley. Texaco reports minor shows but no commercial prospects yet. The well is located in NE NE 6-24s-10e. Texaco held the old depth mark also with 1 Signal drilled to 10,480 ft. 5 years ago about 5 miles southeast of the present deep test.

ILLINOIS BASIN

WESTERN KENTUCKY

New Play Under Way In Cumberland County

The newest hot spot in the western Kentucky basin is Cumberland County. Focal point of the activity is the area 6 miles west of Burkesville at Waterview in D-49. The discovery well here is R. Steinhorst 1 Edward Bryant in 8-D-49. The well flowed 20 bbl. of oil per day on choke from Stoney River at 601-05 ft. This Feburary discovery now has 13 wells drilling nearby.

LOUISIANA

SOUTH LOUISIANA

West Bastian Bay Field Gets Double Extension

Pan American Petroleum Corp. reports completion of two more deep wells in its Bastian Bay field, in Plaquemines Parish lower delta marsh area. One extends production 1½ miles northwest of the field's discovery well. The other is ¾ mile northwest of the discovery well.

The 1½-mile extension is in the company's 3 L. L. & E., in 42-20s-28e. It was drilled to 16,442 ft. as the field's deepest test to date. Completion is in Miocene sands, one topped at 10,677 ft., and the other at 8,714 ft. Both are "new pays" for the field.

From the deeper zone, designated as "J" sand, the well flowed at the rate of 299 bbl. of 41°-gravity oil per day through 9/64-in. choke. From the other, called "C" sand, it flowed 188 bbl. of 40°-gravity oil per day, also through 9/64-in. choke. Gas-oil ratios were 1,201 cu. ft. and 1,463 cu. ft. per barrel, respectively.

The other new well, 4 L. L. & E., flowed 230 bbl. of 41°-gravity oil per day through 5/32-in. choke from the "J" sand, at 10,655 ft., and 107 bbl. of 40°-gravity oil per day, also through 5/32-in. choke, from "K" sand at 10,-987 ft. Gas-oil ratios were 1,348 cu. ft. per bbl. and 837 cu. ft. per bbl., respectively.

These completions give the field a total of six producing wells. Two others are showing for production. The field's discovery well, 1 Buras, was completed in March 1956 with production from a 14,500-ft. sand.

Anse La Butte Discovery Opens Another Pay Zone

Active development around the old Anse La Butte dome, on the St. Martin-Lafayette parish line, northeast of Lafayette, has uncovered another deep oil reservoir.

It is on the south flank of the dome. Discovery is by Commonwealth Oil Co. at its 1 Stoko, in 124-9s-5e. The well was drilled to 10,840 ft. Production is from a 9,000-ft. sand.

Tested through 5/32-in. choke, the well flowed 250 bbl. of oil per day under pressure of 1,000 psi.

MICHIGAN

Gas Logged Trenton Wildcat

Aurora Gasoline Co. and McClure Oil Co. logged first show of gas 78 ft. in Trenton objective at the 1 Rowe, SE NW NE 10-5s-3w, Scipio Township, Hillsdale County. The 1 Rowe is the diagonal northwest 20-acre offset to the Clifford A. Perry 1 Houseknecht, NW SE NE 10-5s-3w, Scipio Trenton oil-gas discovery which has not been formally completed to date.

Amount of gas logged at the 1 Rowe had not been determined. Top of Trenton objective was logged at 3,565 ft. Gas showed at 3,643 ft. Drilling was in progress below 3,665 ft. Oil pay should not be logged for another 100 ft. or more to be comparable with the 1 Houseknecht.

This first follow-up test in the area was checked in virtually flat with the discovery producer.

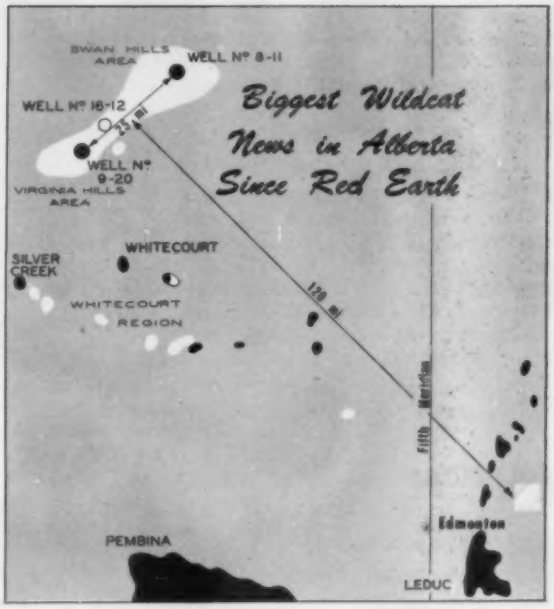
Meanwhile, Perry was continuing to drill deeper in the Trenton at the discovery. This week an additional 3 or 4 ft. of new hole were cut and it appeared that additional oil pay, increasing flow rate, had been logged. Well flowed 108 bbl. of oil natural in 14 hours at new total depth, estimated at about 3,837 ft. At previous depth, 3,837 ft., well flowed an estimated 150 bbl. of oil and 2,100,000 cu. ft. of gas a day. Well will be bottomed out about 300 ft. in Trenton, or at 3,865 ft.

Correction

On page 174 in the April 8 issue of the Journal, Fig. 5, should read "Cross-section of the Strawn including the reef." Under the subhead on the same page "The Noelke Reef," the sentence should read, "Fig. 7 is an isopach of the Strawn including the reef."

Canada Awaits Evaluation of Year's Best Discoveries

by **Grant Miller**



DISCOVERY wells lie in the central west sector of Alberta, 25 miles apart and 15 miles from any previous test on one side and 20 on the other.

VIRGINIA HILLS and Swan Hills, hold the same high position in the oil patch of western Canada this year as Red Earth Creek did at this time a year ago. In many respects a pair of oil discoveries chalked up in these two adjacent areas are like the oil find at Red Earth Creek in the spring of 1956. This pair of discoveries made by the same group that is headed by Canadian independent Home Oil Co., Ltd., didn't start a record-breaking land play like Union Oil's find at Red Earth Creek, but only because land in the general area was already tied up under exploration permit. The new finds were made in a previously nonproductive horizon, the Slave Point section of the Middle Devonian. Like Red Earth they were strictly wildcats, 15 miles from any previous test on one side and 20 on the other.

Another similarity lies in the fact that tests to evaluate the finds will be held up by spring breakup. It is hoped that these production tests will not be delayed as long as follow-up operations at Red Earth Creek, and too, that followup drilling will be possible later this spring and summer. At Red Earth Creek entire operations were suspended because of muskeg conditions until late fall of the discovery year, and have again been shut down for another number of months.

The pair of discovery wells on which the whole of the industry has focused its attention lies in the central west sector of Alberta, 25 miles apart, 120 miles northwest of Edmonton and 70 miles east-southeast of the Sturgeon Lake producing area. Sturgeon Lake is the largest oil-producing area in the Peace River block of northern Alberta and its main producing horizon is the D3 zone of Devonian.

Two such widely separated wildcats cannot at the present stage be classed as major discoveries. More testing is required at the strikes themselves to determine their commercial worth and other wells must also be drilled before it can be proved if the two strikes are contiguous. The drilling team will be able to answer a number of questions when it is able to run production tests at its two finds and will also go a long way in proving the general area with its next pair of exploratory wells.

The operator is waiting for a service rig to production test the first Slave Point discovery well. Very recently drilling operations were completed at the second well and the hole is being logged before setting casing. Already a followup test has been spudded. Another followup well is planned with equipment now under contract in the area.

The first of the pair of new zone discoveries was made at the Home-Hudson's Bay-Union 9-20 Virginia Hills wildcat, on LSD 9 20-65-13w5 early in February. Drill-stem test results showed 5,000 ft. of clean oil in the pipe on a test of interval 9,228 to 9,258 ft. and 2,400 ft. of gassy mud and oil emulsion, estimated 50 per cent oil on following DST from 9,259 to 9,285 ft.

This same well previously indicated gas success in the basal Blairmore formation flowing 5.1 million cubic feet daily on test. After indicating oil discovery in the Slave Point, the No. 9-20 well was deepened to the pre-Cambrian without further oil or gas encouragement. The crew plugged back from total depth of 10,624 ft. to 9,445 ft. and set string of production casing. A service rig will be moved to location as soon as road conditions permit.

At the other discovery, Home et al 8-11 Regent, Swan Hills LSD 8, 11-68-10w5, logging operations are presently under way at total depth of 8,988 ft. Production casing will be set immediately. A single drill-stem test in the Slave Point was completed at this find in the interval 7,785 to 7,923 ft. It showed a moderate gas flow and a recovery of 2,400 ft. of clean oil, 300 ft. of gas-cut mud and 800 ft. of muddy water cushion (input water).

The drilling rig that drilled the 9-20 Virginia Hills oil find has been shifted to the exploration group's third well in the area, Home-Union-Hudson's Bay 16-12 Virginia Hills, LSD 16, 12-66-13w5, 6 miles northeast of the original strike and the crew is now drilling surface hole. Tentative location has been selected for the first followup to the 8-11 Swan Hills discovery and as soon as a rig is available from the present test it will be moved about 6 miles southwest to this new site.

The drilling team, Home Oil, United Oils Ltd., Alminex Ltd., and Geoil Ltd., is sitting pretty at this pair of wells. The team will acquire a one-third interest in P. & N. G. Reservation 2,146 Virginia Hills for drilling a pair of tests, and at the Swan Hills discovery will obtain a 50 per cent stake in Reservation 2,132. Both of the spreads, covering 92,160 acres each were obtained under farmout agreements. The first in a deal with Hudson's Bay Oil & Gas Co., Ltd and Union Co. of California and the second with Trinidad Leaseholds, Ltd.

Shell Oil Co. holds a four township block of reservation rights north of the Virginia Hills and west of the Swan Hills acreage held by Home and associates. The Alberta Government still holds a large tract lying east of the two spreads held by the discovery team. The Crown lands are contained in Virginia Hills Provincial Reserve and a portion will likely be put up for cash bonus in the near future.

MISSISSIPPI

Extension Well Renews Sweetwater Development

Production of Sweetwater field, in southeastern Lincoln County, is being extended a mile west in the first development in that area since late 1954.

Extension is by Shell Oil Co. at its 1 Denkmann, in 22-5n-8e, completed in the lower Tuscaloosa stringer sand at 10,778-90 ft. The well is rated good for 156 bbl. of 34.5°-gravity oil per day through ⅛-in. choke. Potential was based on a 9-hour gage with flow pressure of 675 psi.

Discovery well, drilled by A. O. Phillips, was completed in January 1954 with production from perforations in the above sand at 10,785-91 ft. The discovery was confirmed by Sinclair Oil & Gas Co. the following July by successful completion of a north offset.

Both the east offset, drilled by Shell Oil Co., and northwest offset, drilled by Sinclair Oil & Gas Co., were failures. No other tests have been drilled.

Shell's new extension well was drilled to 11,037 ft. Sinclair's dry hole is between it and the first two wells.

ROCKY MOUNTAIN

ARIZONA

First 1957 Exploration Begins in State

The first Arizona activity of the year is in store for Apache County in the Black Mesa basin. Kerr-McGee Oil Industries will drill the 1 State in NE NW SE 4-19n-26e, 42 miles northeast of Holbrook, Ariz., in the northeastern part of the state.

There will be two other tests later in this area, one in 32-20n-26e, and one in 35-20n-26e. This new Arizona activity will be closely watched by Four Corners and Rocky Mountain operators. Two gas fields were discovered in the state last year, and the heavy concentration of drilling just north in the Paradox basin makes any Arizona activity highly important.

COLORADO

Gas Discovery in LaPlata County

LaPlata County in southwestern Colorado added a new Paradox-Pennsylvanian gas field last week. General Petroleum Corp. F-11-32 Cater, C NW NW 32-34n-12w, flowed gas at the rate of 3,250 M.c.f. daily on drill-stem test at 9.356-9,499 ft.

This discovery well is 5 miles northwest of Red Mesa-Cretaceous gas field and 17 miles southwest of the city of Durango.

MONTANA

Silurian Oil Reported At Outlook Extension

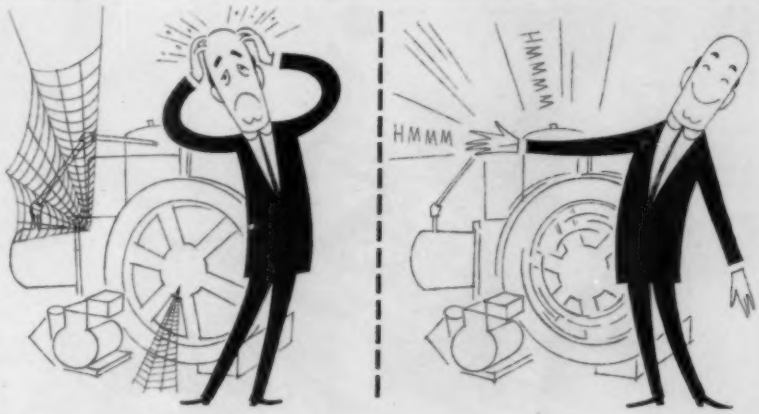
The 1 Rueggsegger extension well in Sheridan County's Outlook area flowed oil on drill-stem test of the Silurian at 9,067-91 ft. The Amerada Petroleum Corp. well is 2 miles northwest of the 1 Tange field discovery well which flowed 2,742 bbl. of oil per day from the Silurian.

The other well in the area, the 1 Loucks, 4 miles southwest of the 1 Tange discovery, is at total depth 10,842 ft. Tests are due here.

NORTH DAKOTA

Upper Ordovician Being Tested at Deep Wildcat

Amerada's deep wildcat inside Beaver Lodge field, Williams County, is testing the upper Ordovician at 12,570-12,610 ft. The 1 Iverson-Nelson flowed 332 bbl. of condensate in 23 hours and 40



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minutes from the Red River-Ordovician at 12,696-12,784 ft. on ½ and ⅜-in. chokes. Another test for 23½ hours got 210 bbl. and 6,917 M.c.f. of gas per day.

TEXAS

TEXAS PANHANDLE

New Field Opened In Ochiltree County

A lower Morrow-Pennsylvanian gas discovery opened a new field in Ochiltree County, 4 miles southwest of Perryton field in Section 3, Block 13, T&NO Survey. The well, Sun Oil Co. 1 Theresa Wright, had a calculated open flow potential of 33,000 M.c.f. of gas daily plus 17 bbl. of condensate per million. Perforations are at 8,680-8,722 ft.

WEST TEXAS

Coke County In Line For Pennsylvanian Strike

Sun Oil Co. 1-A Malone, wildcat 10 miles northwest of Robert Lee, in 321-1A-H&TC Survey, flowed 8.28 bbl. of 46°-oil in 16 hours while drill-stem testing the Pennsylvanian. The test was made through perforations at 5,620-25 ft. Operators reversed out 1,000 ft. of oil and 500 ft. of mud.

The well has had oil shows in the Canyon sand and in the Ellenburger. Swabbing tests of the Ellenburger at 6,985-98 ft. recovered 4 bbl. of oil and 15 bbl. of sulfur water in 3½ hours. Oil and gas-cut mud was recovered from Canyon sand at 5,554-83 ft.

Location of Sun's well is in the northwestern part of the county, about 5 miles east of Jameson field.

Dawson County deep test . . . Hunt Oil Co. 1 Frank Freeman (formerly Skelly Oil Co.), flowed 60 bbl. of oil in 12 hours from Mississippian perforations at 11,159-73 ft. Location is 9 miles southwest of Lamesa in Labor 11, League 275, Glasscock CSL Survey.

Crane strike finished . . . Gulf Oil Corp. has completed its 21 Lea, 10 miles west of Crane, as a Connell sand discovery. Potential was 230 bbl. of 40°-oil through 15/64-in. choke, from perforations at 8,466-88 ft. Tubing pressure was 290 psi., with gas-oil ratio 408:1. Dual completion will also be attempted from the Devonian at 6,126-6,200 ft.

Location is about 2 miles southeast of present Connell production in Lea field, but separated by two deep failures.

Ward County completion . . . Wilson Exploration Co. 1-38 New Era Royalties Co., Delaware sand discovery 7 miles southeast of Mentone, has been completed for 240 bbl. of oil a day. The final test was through 8/64-in. choke, gravity was 32.8° and gas-oil ratio 685:1. Perforations were at 4,764-77 ft.

TEXAS GULF COAST

Discoveries Continue In Galveston Bay Activity

Tidewater Oil Co. has a small gas well in its second discovery in Galveston Bay during the past 2 weeks. Both are in the Chambers County portion of the bay.

It latest discovery is in Section 206, about 1½ miles west of Sun Oil Co.'s 1956 discovery well on North Red Fish Reef field, in Section 132 *(see map The Oil and Gas Journal, April 8, 1957, page 179).*

It is 2 miles west of Tidewater's discovery completion 2 weeks ago in Section 114. The latter well, a mile north of Sun's North Red Fish Reef discovery, tested gas in Frio sand, perforated at 7,838-44 ft.

Tidewater's second discovery well tested 589,000 cu. ft. of gas daily, flowing through small chokes, from per-

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forations at 7,897-7,907 ft. Both of its wells are shut in.

In the meantime, Sun Oil has completed another well in its recently opened Southwest Red Fish Reef field, about 4 miles south of Tidewater's gas discovery in Section 206. It is slightly more than a half mile southeast of the discovery well, oil-productive in a 9,350-ft. Frio sand.

The new well is gas-productive in sand at 10,220-34 ft. with calculated open-flow potential of 10,300,000 cu. ft. per day. Gas carries 58.4°-gravity condensate in the ratio of 45,294 cu. ft. per bbl. It is Sun's third well for the field. The second well, northeast of the oil-discovery well, also was gas-productive with pay at 10,343-47 ft.

Successful Wildcats

ALABAMA

Marion County: Walter Pearson and others 2 First National of Birmingham, 7-11s-11w (½ mile south of Haleys). IP 1,920 M.c.f. daily, 9/16-in., perforated 1,530-50 ft., 1,554-60 ft., and 1,565-71 ft. Lewis-Bethel sand). TD 1,641 ft. (New gas field in Black Warrior basin.)

ALBERTA

B.A.-C.P.R. 10 Damberger, LSD 10, 27-41-19w4. TD 4,110 ft. Viking gas well.

Home et al C&E 7-3 Elkton, LSD 7, 3-31-4w5. 11,447 ft. Mississippian gas wel.

Home-Union-H.B. 9-20 Virginia Hills, LSD 9, 20-65-13w5. TD 10,624 ft. Slave Point oil well.

Imperial 7-7V Red Deer, LSD 7, 7-39-26w4. TD 7,143 ft. D2 oil well.

Okalta-Canpet 11-24 Stadler, LSD 11, 24-30-5w4. TD 2,940 ft. Detrital gas well.

Union 2-4 Red Earth Creek, LSD 2, 4-88-8w5. TD 4,851 ft. Granite Wash oil well.

BRITISH COLUMBIA

Texaco-N.F.A. 6 Boundary Lake, LSD 14, 22-88-15w6. TD 4,192 ft. Indicated Triassic oil well.

CALIFORNIA

Kern County: Reserve Oil & Gas Co. 67-18 Butler-Wehr, SE SW 18-11n-19w, 276 BOPD, 32.5° gravity, 20/64-in. choke, 0.6 per cent cut, 308 M.c.f., perfs. six intervals between 11,850 and 12,200 ft., TD 13,061. (New field discovery 3 miles north of Tejon field.)

Ventura County: Richfield Oil Corp. 1 McNab estate, SE NW 25-4n-20w, 400 BOPD, 33°-gravity crude, perfs. 13,765-13,805 ft. and 13,950-13,965 ft., TD 14,020 ft. (New pool discovery ¾ miles east of Fillmore field production.)

Ventura County: Rothschild Oil Co. 1 Clarkson, SW SW 4-4n-18w, 5½ BOPD, 22° gravity crude, 1 per cent cut, perfs. 1,675-2,172 ft. TD 2,364 ft. (New field discovery on Oil Ridge Anticline.)

Ventura County: The Texas Co. 1 Livingston, NW NE 5-1n-21w, 547 BOPD, 29.9° gravity, 20/64-in. choke, perfs. 8,151-8,420 ft. TD 9,035 ft. (New pool discovery ¾ mile east of Oxnard field deep production).

COLORADO

Washington County: Wytex Oil Co. 1 Stilling, C NE SW 28-1n-54w. IPP 170 BOPD, "J" sand discovery, new field. TD 5,005 ft. "J" sand.

SOUTH LOUISIANA

Acadia Parish: Richardson & Bass 1 Acadia Parish School Board, 16-10s-2e. IP 216 BCPD and 2,290 M.c.f. daily, ⅛-in., 42°, perfs. 12,800-04 ft. TD 15,780 ft. (New pay in South Rayne field.)

Calcasieu Parish: W. E. Walker 1 Walker-Carbello, 26-11s-7w. IP 3,000 M.c.f. daily (estimated) with 50 BC per M.M.c.f., 9/64-in., perfs. 11,275-85 ft. TD 12,211 ft. (New field—completed as shut-in gas well.)

Vermilion Parish: Union Oil Co. of California 2-B OCS 0297, Block 26, Vermilion area, Gulf of Mexico. IP 2,380 M.c.f. daily and 60 BCPD, $\frac{7}{32}$-in., 49.3°, perfs. 10,736-48 ft. TD 13,570 ft. (New offshore field previously indicated by abandoned gas blowout well.)

Calcasieu Parish: Samedan Oil Corp. 1 Brannon, 17-11s-10w. IP 53 BCPD and 3,390 M.c.f. daily, ¼-in., 58.6°, perfs. 9,659-66 ft. TD 9,800 ft. (New pay in Bayou Choupique field.)

W. E. Walker 1 Walker-Corbello, 26-11s-7w. IP 100 BOPD and 3,000 M.c.f. daily, 9/64-in., 55°, perfs. 11,274-83 ft. TD 12,540 ft. (New field—3 miles west of North Chalkley field.)

Jefferson Davis Parish: Colorodo Oil & Gas Co. 1 Lock-Moore, 28-7s-6w (1¾ miles E of Indian Village field). Shut-in oil well (flowed oil and gas while cleaning), no gage. perfs. 8,528-31 ft. TD 9,298 ft. (New field.)

Lafayette Parish: Monsanto Chemical Co. 1 Tortue, 24-10s-5e (9 miles SE of Lafayette). IP 273 BCPD and 2,460 M.c.f. daily, ⅛-in., 51.2°, perfs. 11,448-54 ft. TD 15,729 ft. (New field.)

Lafourche Parish: Pan American Petroleum

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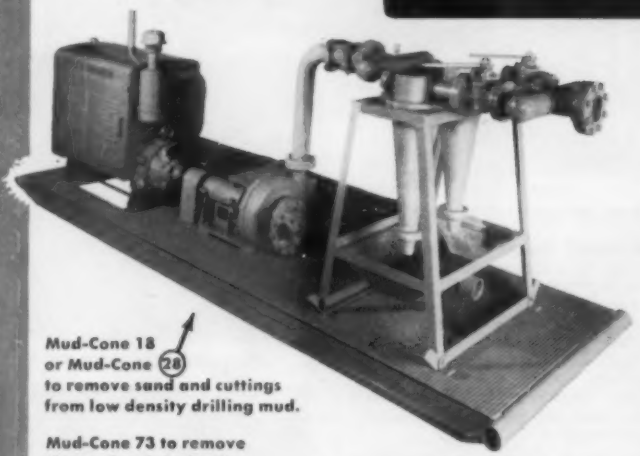

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Corp. 1 Ridgefield Unit 3, 30-15s-16e (¾ mile SE of Thibodaux field). IP 22 BCPD and 4,000 M.c.f. daily, 5/32-in., 51°, perfs. 12,076-90 ft. TD 14,778 ft. (Extends Thibodaux area.)

Terrebonne Parish: Humble Oil & Refining Co. 3-W L.L.&E., 1-19s-12e. IP 504 BOPD, ⅛-in., 35.8°, GOR 746 cu. ft. per barrel, perfs. 12,620-23 ft. TD 14,382 ft. (New pay and extension in Palmetto Bayou field.)

Union Oil Co. of California and Monterey Oil Co. 2 State Lease 2649, Township 23s-17e, in Lake Pelto (4 miles SW of Lake Pelto field). IP 198 BOPD, 7/64-in., 33.5°, GOR 521 cu. ft. per barrel, perfs. 10,716-24 ft. TD 13,224 ft. (New field—Isle Dernieres.)

Vermilion Parish: Magnolia Petroleum Co. 2-A OCS-079 (State Lease 883), Blk. 46, Vermilion area, Gulf of Mexico. IP 20,000 M.c.f. daily and 40 BCPD, open-flow potential, 46°, perfs. 8,259-79 ft. and (dual completion) 15,500 M.c.f. daily and 10 BCPD, open-flow potential, 54°, perfs. 7,052-62 ft. TD 10,292 ft. (New pays in Vermilion Block 46 field.)

Allen Parish: Vincent & Welch, Inc., et al 1 Putnam, 26-6s-3w (3 miles E of North Elton field). IP 101 BOPD and 1,089 M.c.f. daily, 5/32-in., 58°, perfs. 8,688-8,703 ft. TD 8,775 ft. (New field.)

Plaquemines Parish: California Co. 1 State Lease 3035, 21-19s-25e (Saturday Island area). IP 198 BOPD, ⅛-in., 34.6°, GOR 972 cu. ft. per barrel, perfs. 10,350-57 ft. and 10,364-74 ft. TD 11,250 ft. (New field.)

Terrebonne Parish: Union Oil Co. of California and Monterey Oil Co. 2 State Lease 2649 (Lake Pelto). IP 198 BOPD, 7/64-in., 33.5°. GOR 521 cu. ft. per barrel, perfs. 10,716-24 ft. TD 13,225 ft. (New field—Isles Dernieres.)

MICHIGAN

Ottawa County: Cook Drilling Co. 1 DeJonge, SW NW NW 4-5n-14w. IPP 10 BOD, Traverse lime 1,666 ft., pay 1,668-70 ft., TD 1,670 ft. (New pool.)

MISSISSIPPI

Adams County: D. A. Biglane and S. R. Laub 1-W Armstrong, 28-5n-2w. IP 75 BOPD, ⅛-in., 40°, perforations 5,690½-91½ ft. (Wilcox-Luce sand). TD 6,672 ft. Elev. 98 ft., Wilcox 4,624 ft., base Baker shale 6,424 ft. Minter sand 6,710 ft. (New field.)

Lincoln County: Shell Oil Co. 1 Denkmann, 22-5n-8e. IP 156 BOPD, ⅛-in., 34.5°, perfs. 10,778-90 ft. (Lower Tuscaloosa). TD 11,037 ft. Elv. 460 ft., Tuscaloosa 9,829 ft., lower Tuscaloosa 10,687 ft., Lower Cretaceous 10,980 ft. (Extends Sweetwater field.)

NEBRASKA

Banner County: British-American Oil Producing Co. 1 Milo Fink, C SW SW 30-17n-56w. IPP 190 BO and 20 BWPD, "J" sand discovery, new field. TD 6,989 ft. "J" sand.

SOUTHEAST NEW MEXICO

Eddy County: Pan American Petroleum Corp. 1 Greenwood Unit, 27-18s-31e. IP flowed 8,053 M.c.f. gas, plus 516 bbl. 58° condensate in 4 hr., 15 min.; choke, pressures not reported. GOR 15,610:1, top Devonian 12,365 ft., pay 12,362 ft., perforated 12,655-12,700, 12,741-66 ft. TD 13,446 ft., elev. 3,657 ft.

Lea County: Humble Oil & Refining Co. 1 State "AQ," 3-16s-33e. IP 353 BOPD, TP 60 psi., GOR 1732, 39.5°, Pennsylvanian 10,960-84 ft. TD 13,642 ft., PB 10,997 ft., elev. 4,216 ft.

Lea County: Continental Oil Co. 9 Britt B-15, 15-20s-37e, in shallow Eumont field. IP 56 BOPD, 39°, Pennsylvanian 7,700-24 ft. TD 8,536 ft., elev. 3,563 ft.

Eddy County: Denton Oil Co. 2 Hoover, 27-18s-29e. IP 40 BOPD, ¼-in., 36°, pay 2,740 ft. TD 2,879 ft.

NORTHWEST NEW MEXICO

Sandoval County: Continental Oil Co. 1 Rodgers Block "C," C NW SW 24-23n-7w. IPP 16 BOPD, 44° gravity. Gallup sand discovery, new field. TD 6,659 ft. Morrison.

San Juan County: Moore, Moore & Miller 1 Scott, C NW NE 4-24n-10w. IPP 192 BOPD, Gallup sand discovery, new field. TD 5,476 ft. Lower Gallup.

PENNSYLVANIA

Westmoreland County, Mount Pleasant Township: Peoples Natural Gas Co. 4109 B. H. Smithley, elevation 2,001 ft., 2,564,000 cu. ft. gas, chert 7,364 ft., gas, Oriskany sand 7,497 ft. TD 7,539 ft.

SASKATCHEWAN

Imperial Canadian Superior 3-35 Browning, LSD 3, 35-6-5w2. TD 4,525 ft. Mission Canyon oil well.

Parmount Leach Felmont Can. 1-33, Schiestel, LSD 1, 33-4-3w2. TD 4,415 ft. Charles oil well.

Imperial 15-5 Dalesboro, LSD 15, 5-6-3w2. TD 4,460 ft. Mission Canyon oil well.

NORTH TEXAS

Archer County: La Gorce Oil Co. 1 Grace Bell, W. Porter Sur., A-1074, 3½ miles SE Archer City. IP 403 BOPD, 16/64-in., TP 450 psi., Gor 650, 42°, pay 5,250 ft. TD 5,503 ft.

Akin & Dimock 1 Hoffman, Lot 31, Blk. 3, Clark & Plumb, 2 miles SW Scotland. IP 192 BOPD, 16/64-in., TP 200 psi., 43°, GOR 500, perfs. 5,086-5,128 ft. TD 5,140 ft.

Cooke County: Burk Royalty Co. 1-B Wilson "D," B. Sullivant Sur., 5-581, 6 miles E Gainesville. IP 114 BOPD, ¼-in., TP 50 psi., 39°, GOR 350, pay 3,588 ft. TD 3,604 ft.

Grayson County: Concho Petroleum Co. 1 Anderson, T. Toby Sur. 36, A-1244, 6 miles N Whitesboro. IPP 93 BOPD, 39°, GOR 300, pay 6,363-71 ft. TD 6,564 ft. New field name, West Sandusky.

Jack County: E & H Drilling Co. 1 Myers, C. W. Hassell Sur., 6 miles NW Jacksboro. IPP 42½ BOPD, 38°, GOR 100, pay 2,744 ft. TD 2,748 ft.

Young County: Jefson Oil Co. and Bolin Oil Co. 1-A Woodward, Sec. 2728, TE&L Sur., 5½ miles SE Loving. IPP 122 BOPD, 40°, GOR 380 pay 3,284 ft. TD 3,292 ft.

Baylor County: I. J. Wolfson 1 Ignac Hostas, 1-1-D&W, 10 mi. SW Seymour. IPP 37.8 BOPD, 36°, GOR 350, Tannehill sand 1,380-84 ft. TD 1,468 ft.

Knox County: Hill & Moore 1 Hertel, 13-2-D&W, 5½ mi. N Goree. IPP 47 BOPD, 35°, GOR 125, Tannehill sand 1,750-62 ft. TD 1,978 ft.

Wise County: Westbrook Oil Corp. 1 D. M. Holt, W. A. Ross Sur., A-959, 2 mi. NW Chico. IP 125 BOPD, 20/64-in., CP 100 psi., 40°, Atoka conglomerate 5,640-95 ft. IP 184 BOPD, 20/64-in., TP 100 psi., GOR 674, 41°, Caddo limestone 5,299-5,310 ft.

Young County: J. W. Hastings et al 1-E Holcomb, J. W. Moore Sur., A-2305, 7½ mi. W Graham. IP 120.39 BO in 12 hr., 32°, GOR 960. Marble Falls 4,227-32 ft. TD 4,236 ft.

WEST CENTRAL TEXAS

Brown County: Katherine Hanjeian 3 Swenson, J. Hernandez Sur. 351, 2 miles W Bangs. IPP 52 BOPD, 38°, pay 1,134 ft. TD 1,141 ft.

Coleman County: Bridwell Oil Co. 1-F Mary Dunman, Sec. 100, Blk. 2, GH&H Sur., 4½ miles NE Goldsboro. IP 34 BOPD, 9/64-in., 40°, GOR 875, pay 3,663-68 ft. TD 3,805 ft.

Jones County: Good Earth Oil & Gas Co. 1 W. W. West, J. W. McKissick Sur. 204, 3 miles SW Anson. IPP 24 BOPD, 40°, Palo Pinto 4,144 ft. TD 4,712 ft.

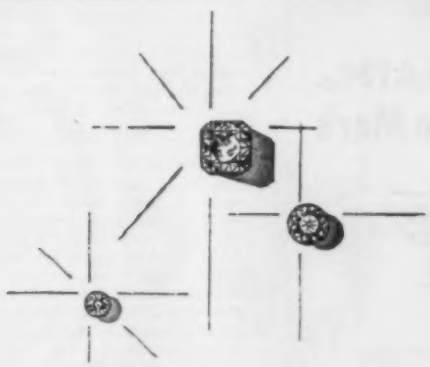
Coleman County: Amerada Petroleum Corp. 1-E Harris, John Sanders Sur. 162, Subd. 3, 2 mi. SW Burkett. IPP 87 BOPD, 38°, GOR zero, Ellenburger 3,470-91, 3,504-16 ft., TD 3,545 ft. Suggested field name, Burkett-Ellenburger.

Nolan County: Sun Oil Co. 1 Bessie Hollins, 29-22-T&P, 5 mi. NW Sweetwater. IP 54 BOPD, 24/64-in., TP 40 psi., GOR 281, 41°, Pennsylvanian sand 5,732-60 ft. TD 6,730 ft.

Stonewall County: Midwest Oil Corp. 1 Pat Mitchell, 222-D-H&TC, 4 mi. N Swenson. IPP 189 BOPD, 41.8°, GOR 893, Ellenburger 6,491-97, 6,505-10 ft. TD 6,510 ft.

Throckmorton County: Burk Royalty Co. 1 Nannie Wright, Sec. 256, BBB&C Sur., A-972, 2 mi. SW Throckmorton. IP 122 BOPD, ½-in., TP 400 psi., 40°, GOR 800, pay 4,376 ft. TD 4,411 ft.

Leo Vesenmeir 1 Ross Sloan, Tract 1, Nancy Williams Sur., A-830, 6 mi. SW Woodson. IP 188 BOPD, 15/64-in., TP 250



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TULSA, OKLAHOMA.

psi., GOR 560, 41°, Mississippian 4,547-51 ft. TD 4,551 ft.

WEST TEXAS

Crockett County: Texita Oil Co. et al 1-A Hoover, 4-1-GC&SF, 30 miles NW Ozona. IP 81 BOPD, ¼-in., 30°, TP 1,025 psi., San Andres 1,882-92 ft. TD 2,049 ft.

Midland County: Murphy H. Baxter 1 Crespi Unit, 20-38-T2S-T&P, 8 miles SE Midland. IP, calculated, 7,600 M.c.f. gas, plus 1,101 bbl. 59° condensate, Strawn perfs. 10,331-54 ft.; IP 442 BOPD, 47.5°, GOR 3,650:1, 18/64-in., Devonian perfs. 11,460-11,520 ft. TD 11,715 ft. Strawn extension to Azalea field, Devonian discovery.

Motley County: Pan American Petroleum Corp. 1 Brandon, Sec. 7, Blk. 0-4, WTRR Sur., 5½ miles E Roaring Springs. IPP 232 BOPD, 42°, Permo-Pennsylvanian 4,150-70 ft. TD 6,123 ft.

Garza County: J. Paul Karcher 1 S. C. Storie, 1303-1-EL&RR, 2 mi. NW Close City. IPP 61 BOPD, 38°, GOR 363, Glorieta 4,160-64, 4,171-78, 4,184-92, 4,244-52 ft. TD 4,350 ft. New field name, Storie-Glorieta.

SOUTHWEST TEXAS

Atascosa County: Robert Mosbacher and W. T. Mendell 1 Troell, J. Poitevent Sur., A-710. IP 7,900 M.c.f. daily, open-flow potential, GOR 32,840 cu. ft. per barrel, 47.5°, perfs. 8,182-90 ft. (Edwards). TD 8,215 ft. (New pay in South Pleasanton area—1,150 ft. west of above operators' 1 Butts & Sawyer, recent Anachacho discovery.)

Guadalupe County: Walter C. Gibson 1 Baker, Samuel Highsmith Sur., A-25. IPP 35 BOPD, 36°, perfs. 2,163-67 ft., 2,190-93 ft., 2,208-12 ft., 2,228-31 ft., and 2,320-24 ft. (Austin chalk-Eagleford-Buda). TD 2,365 ft.

Maverick County: Sutton Drilling Co. 13 Halsell, I&GN Sur., A-961. IPP 24.33 BOPD, 36°, perfs. 1,279-89 ft. (Navarro-Olmos). TD 1,357 ft. (New field.)

McMullen County: Argo Oil Co. 1 Roos, Charles T. Stansel Sur. 102 (9 miles NE of Seven Sisters). IP 23,800 M.c.f. daily, open-flow potential, GOR 25 M.c.f. per barrel, 58.6°, perfs. 7,473-7,550 ft. (Wilcox). TD 9,505 ft. (New field.)

Jim Hogg County: W. Rinehart Miller and E. J. Pearl 1 Armstrong, Sur. 107, A-232. IPP 17.25 BOPD, 42°, perfs. 3,168-71 ft. TD 3,766 ft. (Discovery well El Numero field.)

Jim Wells County: W. B. Osborn 1 Wilson, Lot 51, L. G. Collins Farm Lots, Sur. 290, A-451. IP 26 BOPD (net), 35 per cent water, ⅛-in., GOR 700 cu. ft. per barrel, perfs. 4,916-20 ft. TD 5,450 ft. (New pay in Alice field.)

TEXAS GULF COAST

Calhoun County: Superior Oil Co. 1-D W. L. Traylor, Phillips Dimmit Sur., A-11 (6 miles NW of Olivia). IP 3,240 M.c.f. daily and 233 BCPD, $\frac{7}{16}$-in., 50.6°, perfs. 9,371-81 ft. (Frio), and (dual completion) 3,690 M.c.f. daily and 183.5 BCPD, ¼-in., 54.6°, perfs. 8,410-18 ft. (Frio). TD 11,987 ft. (New field—Point Comfort area.)

Chambers County: Tidewater Oil Co. 1 State, Tract 206, Galveston Bay. Shut-in gas well (flowed 292 M.c.f. daily, ⅛-in., 12-hour gage), perfs. 7,897-7,907 ft. (Frio). TD 9,150 ft. (New field.)

Humble Oil & Refining Co. 1-N State, Sec. 11-E, Trinity (upper Galveston) Bay. Shut-in gas-condensate well (flowed at rate of 129.96 BCPD and 194.1 M.c.f. daily, $\frac{7}{16}$-in., 57.1°, 1-hour gage), perfs. 8,506-17 ft. TD 8,831 ft. (Second well and new-pay discovery in West Trinity Bay field.)

Tidewater Oil Co. 1 State, Tract 114, Galveston Bay. Shut-in gas well (flowed at rate of 1,000 M.c.f. daily, 5/32-in., 3-hour test, GOR 40 M.c.f. per barrel), perfs. 7,838-44 ft. (Frio). TD 9,151 ft. (New field.)

Hardin County: Ada Oil Co. 1 Kinsolving, P.A. Work Sur., A-600 (1½ miles southwest of North Beach Creek field). IP 8,000 M.c.f. daily, open-flow potential, dry gas, perforations 7,168-75 ft. TD 7,310 ft. (New field—Kin-Ada.)

Calhoun County: Gordon Grasty 1 Appling, William Arnold Sur., A-2. (1 mile from Port Alto). IP 56,000 M.c.f. daily, open-flow potential, GCR raito 41 M.c.f. per bbl., 57.8°, perforations 8,482-88 ft. TD 8,600 ft. (New field.)

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Abstracts

THIS is the last of a series of selected abstracts from the February meeting of the Rocky Mountain Association of Petroleum Geologists held in Salt Lake City.

The Possibilities of Weber Stratigraphic Traps in Rangely Area of Northwest Colorado

FLOYD H. HOFFMAN, The Texas Co., Salt Lake City.

DURING early Pennsylvanian time east Utah and northwest Colorado were part of a broad north-trending shelf. The Oquirrh basin was the dominant negative feature and

was centered generally in the Bingham-Salt Lake area. This basin apparently was an area of continuous deposition from Mississippian to Permain time. A shallow trough extended eastward from the geosynclinal Oquirrh basin and intermittently connected it with the central Colorado zeugogeosyncline. The lower Pennsylvanian Morgan and overlying Weber formations were deposited in this broad shallow trough and are believed to be shelf deposited equivalent of the Permo-Pennsylvanian geosynclinal Oquirrh formation. As such, the Weber transects the Permo-Pennsylvanian time boundary.

The Uncompahgre and Park Range uplifts became very active in early Des Moines time. The Uncompahgre trends northwest from south-central Colorado and dies out in east-central Utah, while the Park range trends north from central Colorado. The deep central Colorado neugogeosyncline was formed between these southeast converging highs. The shallow east-west trough which connected the zeugogeosyncline with the Oquirrh basin was north of the Uncompahgre.

The Uncompahgre was the chief source of clastics comprising the Weber formation and its equivalent. These clastics were dumped north and northwest into the shallow trough and on into the Oquirrh basin. The arkostic Maroon formation forms a wide belt around the uplift areas. The Maroon interfingers with and is overlapped by the relatively clean quartzose sandstone of the Weber. Therefore, the Maroon formation is essentially a near-source facies change in the Weber formation.

Samples and cores from wells show an interfingering relationship of the Weber-Maroon at Rangely and Thornburg fields. These data also show Weber reservoir characteristics to be considerably more favorable than Maroon. Consequently the possibility of significant stratigraphic trapping of hydrocarbons along the Weber-Maroon facies change is good. Both Rangely and Thornburg fields are located on this facies change and may have been in areas of general oil accumulation prior to formation of local structural traps by Laramide folding.

Mississippian Sedimentation and Oil Fields in Southeastern Saskatchewan

RALPH W. EDIE, Andrichuk and Edie, consultants, Calgary.

MARKED facies changes occur in the Mission Canyon and lower part of the Charles formation (Mississippian) in southeastern Saskatchewan. Northeastward from the basinal area, five successive environments of deposition with characteristic rock types and organisms may be mapped within individual lithologic units as follows:

1. **Basinal-open marine:** Dark brown-gray argillaceous limestone containing scattered white crinoid columnals, black bituminous shale partings, and brownish gray chert.

2. **Bank margine-open marine:** Cream to light gray fossilferous-fragmental limestones containing crinoids, bryozoa, brachiopods, and forminifera.

3. **Bank.** Cream precipitated limestones including oolitic, pseudo-oolitic and lithographic types. Organisms include few scattered gastropods and algae.

4. **Bank margin-lagoon side:** Cream earthy textured argillaceous limestone containing ostracods and earthy to very finely crystalline secondary dolomites.

5. **Lagoon:** Anhydrite.

Stratigraphic trap oil accumulations occur where permeable units of the Mission Canyon and Charles are truncated and overlain by

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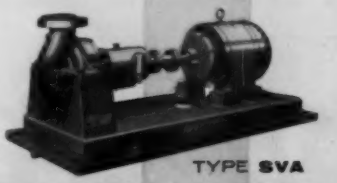

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Temperature — °F	To 300	To 300	To 850	To 850
Number of stages	One	One	One	Two

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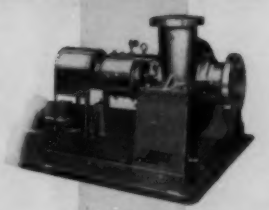

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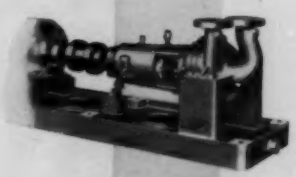

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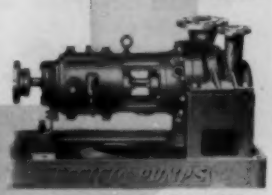

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pre-middle Jurassic red beds. Factors affecting oil accumulation include the presence of:

a. Permeable reservoir beds at or near the unconformity.

b. Anhydrite filling the pores where the permeable reservoir beds are truncated by the pre-Jurassic erosion.

c. Anhydrite beds conformably overlying and underlying the permeable units forming a roof and floor for the reservoir beds.

d. Topography on the Mississippian erosion surface.

Mississippian strata in the oil-producing area of southeastern Saskatchewan are characterized by:

1. Relatively steep dips (40 to 60 ft. per mile as compared with dips of 10 to 20 ft. per mile in much of southwestern Saskatchewan).

2. Relatively rapid truncation (15 to 40 ft. per mile as compared with an average of approximately 5 ft. per mile in southwestern Saskatchewan).

3. Relatively saline waters (50,000 to 150,000 p.p.m. chloride ion as compared with 100 to 8,000 p.p.m. in southwestern Saskatchewan).

In exploration for new trends or extensions of known producing areas, important consideration should be given to the distribution of permeable rock facies within individual stratigraphic units. In addition, it is possible to predict the location of topographically high trends as the various lithologic types are differentially resistant to erosion. For example, the precipitated bank limestones are relatively resistant to weathering and form topographic ridges at Nottingham field. The lower limit of oil accumulation within reservoir beds may be determined by the location of a spill point, in turn controlled by the downdip limit of lagoonal anhydrite floors.

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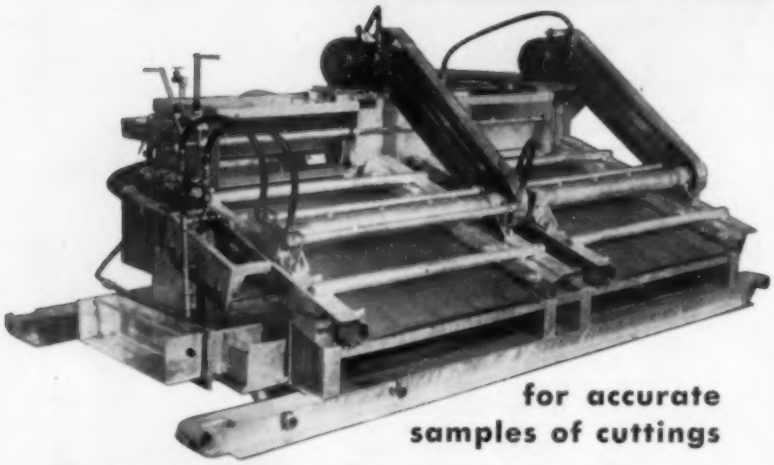

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Bisti Oil Field, San Juan County, New Mexico

J. Q. TOMPKINS, Sunray Mid-Continent Oil Co., Salt Lake City.

BISTI oil field in central San Juan County, New Mexico, produces oil from the Gallup sandstone formation, Mesaverde group of Upper Cretaceous age. The field is a stratigraphic type trap on the homoclinal south flank of the San Juan basin. Accumulation of oil is independent of local structure. The reservoir is composed of an offshore sand bar and an underlying less permeable silty sandstone. Both updip and downdip from the field, facies change from sandstone to siltstone. Similar lateral gradation probably forms the trap.

The Gallup sandstone is predominantly a marine strand line deposit controlled by northeast regression of the sea across the Cretaceous San Juan embayment. Relatively recent basinal tilting has introduced hydrodynamic factors. Subsurface studies suggest that tectonic movements have caused a reversal in the original structural attitude of Bisti field.

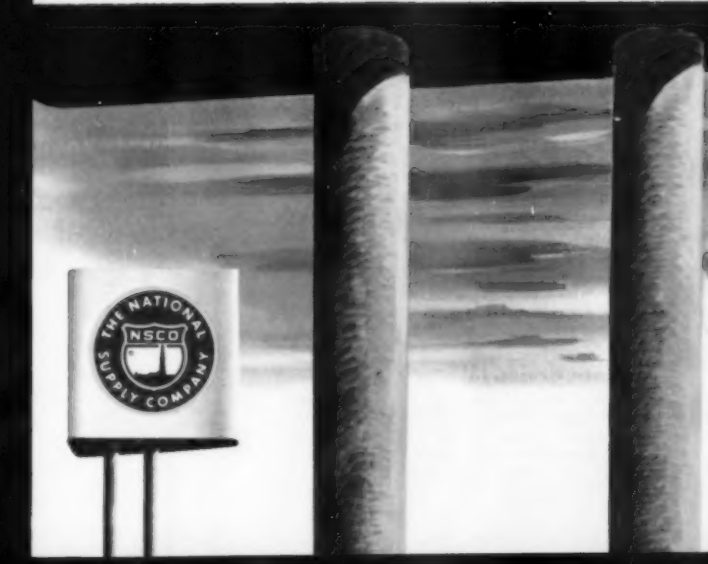
The Relation of Stratigraphy to Oil Accumulation at Aneth and Other Paradox Basin Fields, Four Corners Area, Utah, New Mexico, and Arizona

GEORGE HERMAN and **CLIFFORD A. BARKELL,** Shell Oil Co., Salt Lake City.

THE Paradox salt basin is an elongate northwest-southeast trending Pennsylvanian depositional basin extending from central Utah through the Four Corners area. The Pennsylvanian system is comprised of the Molas formation, a basal dark-red shale unit deposited on the karst topography eroded into Mississippian carbonates, and the Hermosa formation. The Hermosa formation, wherever evaporites and restricted carbonates are present, is divisible into three members: the upper Hermosa, Paradox, and lower Hermosa. The Paradox member is an evaporite megacyclothem composed of distinct sedimentary sequences which are complete or partial cyclothems. The member is gradational and interfingers with open marine sediments of the upper and lower members above and below. Laterally, to the south, southwest, and west, the relationships with the undifferentiated Hermosa formation are similar, but to the northeast restricted sediments of the Paradox member grade into and interfinger with coarse clastics derived from the Uncompahgre uplift.

Since 1954, eleven Pennsylvanian discoveries and several important field extensions have resulted in substantial oil and gas reserves, with at least one field, Aneth, being of major importance. All accumulations found to date, with the exception of Mexican Hat, are associated with the evaporite cyclothems of the Paradox member or its normal marine lateral equivalent. Two important productive objectives, the Desert Creek and Bluff zones, are widespread in the Four Corners area.

Accumulations in reservoirs having similar stratigraphic position to these zones have been found but, except for Barker Creek gas field, appear to be of lesser importance. Rapid lateral and vertical variations in the porosity and permeability of potential and proven reservoir beds make facies studies a necessary tool of exploration and production in evaluating structures and field development. Daily production from Pennsylvanian strata in the Four Corners area is limited at the present time to a small fraction of the potential due to lack of outlets.



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Continued on next page

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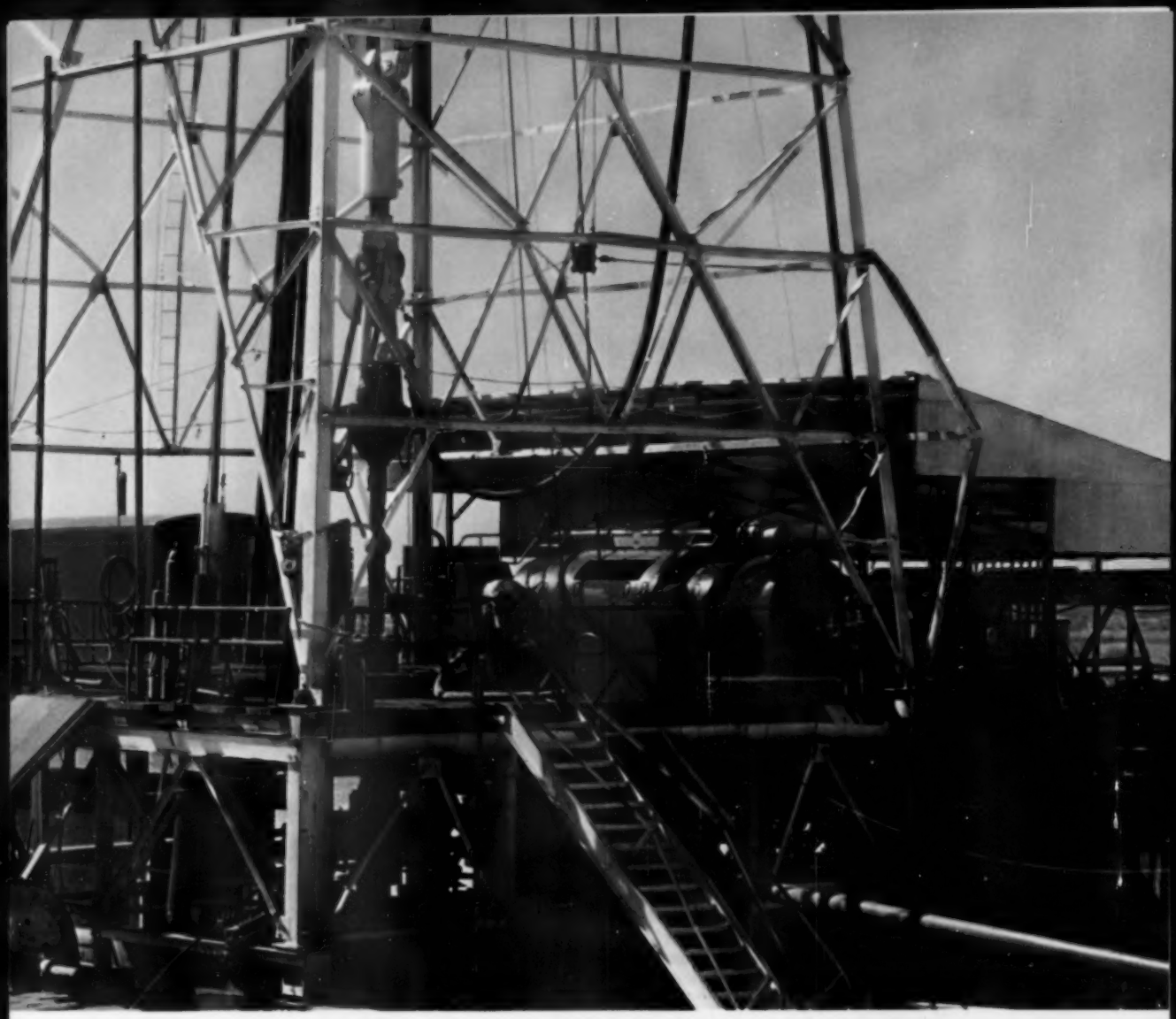

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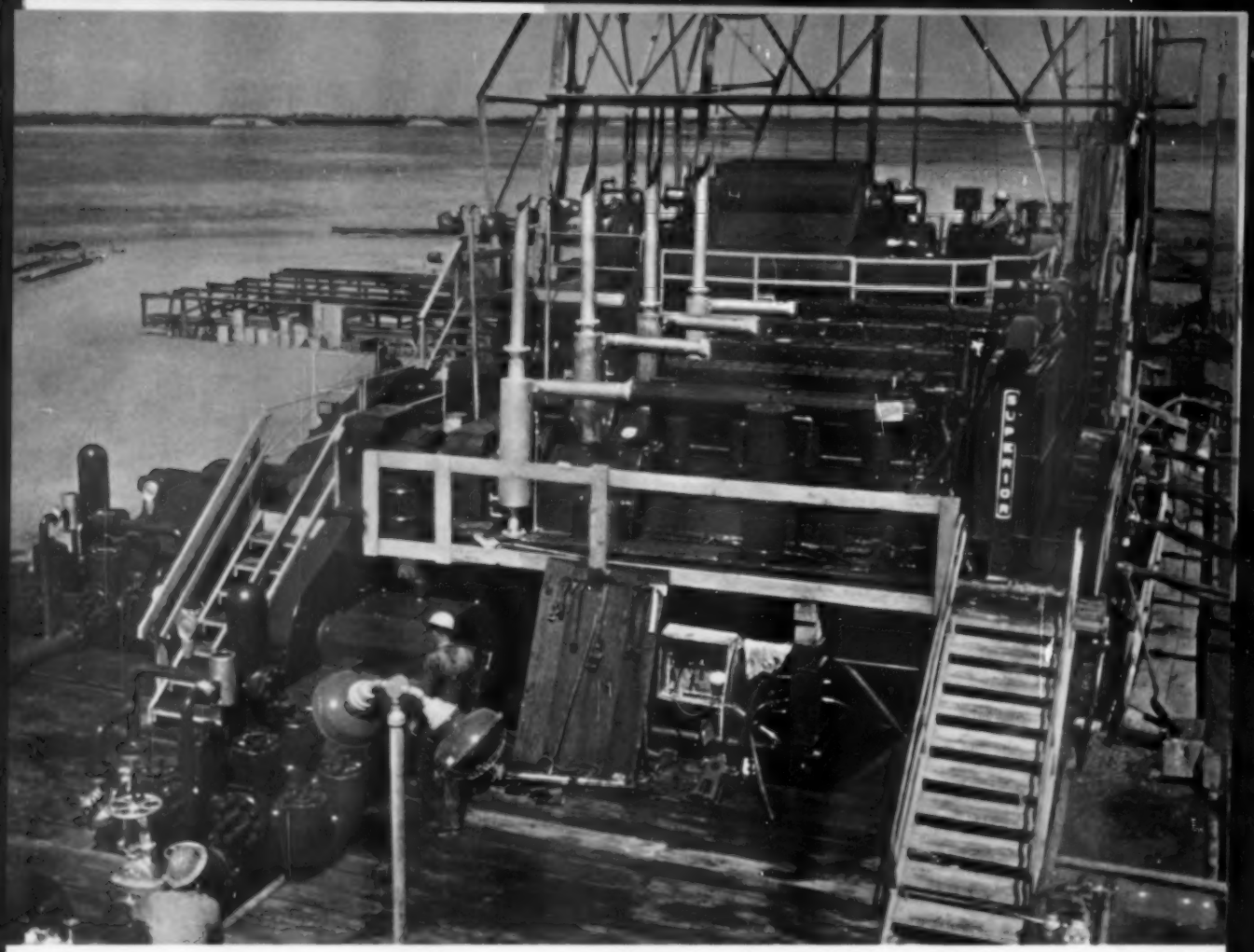

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Peeler Moves Up With Amoco

IT'S a pretty big jump from the administration of a single refinery to coordination of half a dozen of them in as many different states.

But Texan Winston S. Peeler apparently has made it as smoothly as a track star taking the low hurdles. He was handed the new responsibilities with his recent promotion to general manager of manufacturing operations for American Oil Co. in New York.

Peeler's office is on the eighth—the "executive" — floor of the Amoco Building at Manhattan's Fifth Avenue and Forty-sixth Street. It has a serene, untroubled atmosphere about it. Everything apparently has a place and everything seems to be in its place. The desk is immaculate. The entire setup gives you the impression of being a part of a well-oiled, smoothly functioning operation.

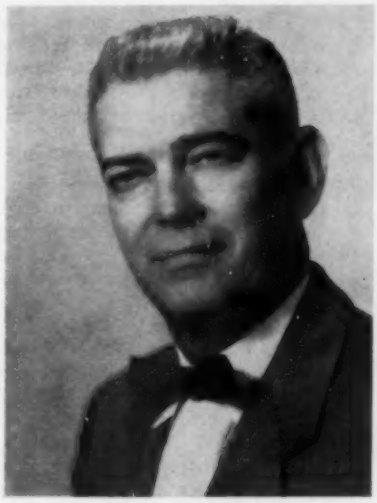
This superficial appearance must be, to some degree, deceptive. The refineries which Peeler has the responsibility of coordinating are spread from Texas City, Tex., to Baltimore, Md. They range from 7,000 bbl. daily at Savannah, Ga., to 160,000 bbl. daily at Texas City.

Some are virtually complete, some specialize. The Savannah and Baltimore refineries, for example, are primarily asphalt refineries. They treat a variety of crudes, the East Coast refineries running foreign crudes from the Maracaibo fields of Venezuela, and the southwest refineries processing domestic crudes. The varieties in location, in processing equipment, and in charging stock make it certain that their coordination is not as simple as it seems.

His "empire" . . . Texas City is the largest, Savannah the smallest, and Yorktown, Va., with its 35,000-bbl. capacity, the newest. Others are at El Dorado, Ark., 40,000 bbl.; Destrehan, La., 37,100; and Baltimore, Md., 10,000—a total of 289,500 bbl. daily. There's a lot crude oil going in and a lot of products coming out.

Peeler is a temporary resident of Manhattan, making his home in a midtown New York hotel. He'll be there until a new home is completed in Stamford, Conn., approximately 25 miles from the office. Despite the fact that he is a Texan, born and bred, he is willing to admit, and not begrudgingly, a liking for New York. He is a native of Dallas.

At 555 Fifth Avenue he reports to Dr. H. R. Snow, vice president in charge of manufacturing. Peeler moved into his present post from the Texas City refinery where he had been general superintendent of the administrative department since late 1953. As a matter of fact, his entire career up to his promotion to the New York office was spent in Texas City.



WINSTON S. PEELER

. . . He makes a tough job look easy.

Not only was his career spent in one city but it was also spent with one company. He joined Pan American Refining, now a part of American, in March 1934. He was graduated the previous year from Rice Institute in Houston as a chemical engineer.

The way up . . . His progress in the company has been steady but not spectacular. His first job was in the "lab," staffed in those days by four or five persons. In time, the lab grew to become the Research and Development Department. Peeler spent his first 10 years with the company in that department, ending up as head of Technical Service.

He switched to the operating end as assistant department head in the thermal cracking division. He spent 2½ years there and then moved to the light oils department—alkylation and treating—where he spent 1½ years.

Another distinct switch was made in 1949 when he headed up the Department of Coordination and Economics. He took his first administrative post July 1, 1952, when all the operating departments were consolidated and he became operating superintendent. In 1953 he became general superintendent of the administrative department and second in command to the plant manager.

Peeler's varied experience at Texas City—research and development, operating, coordination and economics, and administrative—gives him a rare background for his present job and qualifies him well for it.

Ed H. Heylmun, Jr., district superintendent and geologist for Pubco Petroleum Corp. in Casper, Wyo., has opened consulting offices there.

Howard Codet has been appointed acting section head in Esso Research & Engineering Co.'s petroleum development division, Linden, N. J.

Fred J. Hischier, district manager for The California Co. at Billings, Mont., has retired after 27 years with the company. He has been in Billings since 1940.

Charles M. Tarr, Continental Oil Co.'s district superintendent at Carmi, Ill., has been transferred to Wichita as district division superintendent. **D. W. Buchanan** will succeed Tarr at Carmi.

John B. Tweedy has been named assistant to the chairman of the board of Southern Natural Gas Co. A partner in Tweedy & Fowler, Denver law firm, Tweedy is a director of the Offshore Co., subsidiary of Southern Natural Gas.

P. H. Garrison, Canadian division geophysical supervisor for Pan American Petroleum Corp. in Calgary, has been transferred to company headquarters in Tulsa as geophysical supervisor. He will coordinate Pan American's geophysical operations in the United States and Canada.

Dr. E. V. Murphree, president of Esso Research & Engineering Co. and for the past year special assistant to the secretary of defense for guided missiles, has been nominated by President Eisenhower to serve on the general advisory committee of the Atomic Energy Commission.

J. J. Giammaria has been appointed research associate at the Paulsboro, N. J., laboratory of Socony Mobil Oil Co.

George E. Merkle, executive vice president of Fiske Brothers Refining Co., Newark, N. J., has been elected president. He succeeds **F. J. Snyder, Sr.**

Personals

Dr. Carroll Karkalits has been appointed supervisor of research by Petro-Tex Chemical Corp., Houston. Karkalits was supervisor of economic and process appraisal for Food Machinery & Chemical Corp. at Princeton, N. J., before joining Petro-Tex. He is a graduate of Rice Institute and the University of Michigan.

B. T. Ogilvie, process engineer with Fluor Corp. in Los Angeles, has joined National Petrochemicals Corp. in Tuscola, Ill., as senior technologist.

Fred C. Boucke, assistant to the vice president (Eastern Hemisphere) of Standard Oil Co. of California, has been named manager of the Eastern Hemisphere staff. Boucke has been on the Eastern Hemisphere staff since 1954.

Robert B. Parriott, vice president of Stickle Drilling Co., has been nominated to be a director of Sunray Mid-Continent Oil Co. Parriott will succeed his father, the late F. B. Parriott, on the Sunray Mid-Continent board. The new director will be elected at a May 14 stockholders' meeting.

C. D. Miller, vice president of Republic Natural Gas Co., has been elected president. He succeeds **W. H. Wildes** who has been elected chairman of the board. Wildes had been president of Republic since 1934. Miller was with Harper-Turner Oil Co. before joining Republic, and before that time was executive vice president of British-American Oil Producing Co.

C. J. Stanberry, Texas Gulf Coast division production superintendent in Corpus Christi, Tex., for Continental Oil Co., has been promoted to superintendent of the company's Louisiana production division in Lafayette, La. He succeeds the late W. J. Lueck. **C. A. Ward,** assistant division production superintendent in Lafayette, moves up to superintendent of Texas Gulf Coast production, succeeding Stanberry. Stanberry joined Conoco in 1939. He has been Texas Gulf Coast division superintendent since 1955. Ward has been with the company since 1926. He was district production superintendent in Goliad, Fort Worth, and Wichita Falls, before going to Lafayette as assistant division superintendent in 1955.

C. A. Willner has been named division geophysical supervisor in Pan American Petroleum Corp.'s North Canada district. **M. R. Hewitt** has been appointed district geophysicist.

J. L. Laird has been named manager of manufacturing for Suntide Refining Co., Corpus Christi, Tex. **J. B. Hutsell** has been appointed superintendent, with **R. L. Delahoussaye** as assistant superintendent.

Harold T. Connally, George Armistead & Co. consulting chemical engineer in Washington, D. C., has joined Kerr-McGee Oil Industries, Inc., in Wynnewood, Okla., as chief process engineer.

Graham F. Towers, Ottawa investment banker, has been named chairman of the new BP Canada, Ltd., Canadian subsidiary of British Petroleum Co., Ltd. BP recently announced plans to enter Canada's marketing picture. The company is building a new refinery at Montreal.

Joe Murphy assistant to the superintendent of Esso Standard Oil Co.'s Bayonne, N. J., refinery, has been named assistant to the plant manager. **Ed Hughey,** head of manufacturing and fuel products terminalling department, has been promoted to operations superintendent, a new position. **Howard Blose,** head of fuel products terminalling, will replace Hughey and **Gordon Seeler** will replace Blose in fuel products terminalling.

Don R. Johnson, Gulf Oil Corp., has been elected chairman of the Mid-Continent section, Society of Petroleum Engineers of the American Association of Mining, Metallurgical, and Petroleum Engineers. Other Mid-Continent section officers are **John E. Eckel,** Carter Oil Co., first vice chairman; **Max L. Knott,** Oklahoma Natural Gas Co., second vice chairman; **Wayne E. Swearingen,** Alex W. McCoy Associates, treasurer; and **E. H. Timmerman,** Shell Oil Co., secretary. Named to the executive committee were **Fred V. Kluck,** Ohio Oil Co.; **W. F. Stiles,** Buffalo Oil Co.; **J. W. Walters,** Sunray Mid-Continent Oil Co.; **Francis R. Conley,** Continental Oil Co.; **Shofner Smith,** Phillips Petroleum Co. Ex-officio members of the executive committee are **John P. Hammond,** Amerada Petroleum Corp., national president of the society; **M. B. Penn,** Sunray Mid-Continent Oil Co.; **Wilton E. Loy,** Schlumberger Well Surveying Corp.; **Guy F. Williams,** Dowell Incorporated; **R. H. Gwinner,** First National Bank & Trust Co. of Tulsa; and **L. E. Elkins,** Pan American Petroleum Corp.

Ed Godwin-Austen, vice president of Midwest Oil Co. in Denver, has joined Coronet Oil Co. as general manager.

O. L. Mullen, general construction superintendent with Fish Engineering Corp., has retired.

Carl S. Kelley, project engineer with Phillips Petroleum Co., has been transferred to Sweeny, Tex., from Boston.

Guy M. Walker, formerly with Russell Engineering Co. in Abilene, Tex., has joined J. R. McLean, independent operator, as geologist in Abilene.

W. A. Eardley, manager of Standard Oil Co. of California's northern division production department at Taft, Calif., has transferred to London on loan to Iranian Oil Participants, Ltd.

Ed Parkes, executive vice president of United Gas Corp. and president of Union Producing Co. and United Gas Pipeline Co., has been appointed chairman of the American Gas Association's committee on natural-gas reserves.

J. S. Hart has been appointed area production manager for British American Oil Co., Ltd., in Estevan, Saskatchewan. **Keith S. Birdsell** has been appointed production foreman and **T. C. Piper** has been named assistant production foreman there.

R. E. Neely, area engineer at Odessa, Tex., for Tidewater Oil Co., has been transferred to Kamay, Tex. **H. J. Tuffly, Jr.,** will transfer to Odessa from Spraberry, Tex., to replace Neely. Tuffly will be replaced as area engineer at Spraberry by **D. W. Rice,** senior field engineer at Hobbs, N. M.

John Masters, district geologist with Kerr-McGee Oil Industries, Inc., in Calgary, has received the George C. Matson award of the American Association of Petroleum Geologists. The award goes to an author for excellence in presentation of a technical paper at the association's annual convention.

Ross Bolton, Crescent Corp., Tulsa; **D. L. Trax,** Topeka, Kans.; **Fred Neslage,** West Pampa Repressuring Association, Pampa, Tex.; **J. H. Field,** Sohio Petroleum Co., Oklahoma City; and **L. E. Fitzjarrald,** Phillips Petroleum Co., Bartlesville, Okla., received citations for service at the American Petroleum Institute's Mid-Continent production division meeting in Tulsa last week. The national awards recognize outstanding service to the industry and to the A.P.I. Mid-Continent production district.

Personals

Eskil I. Bjork, president of Peoples Gas Light & Coke Co., has been elected chairman of the board and chief executive officer. **Joseph J. Hedrick,** president of Texas Illinois Natural Gas Pipeline Co. and Natural Gas Pipeline

E. I. BJORK

J. J. HEDRICK

Co. of America, subsidiaries of Peoples Gas, has been elected president of the company succeeding Bjork. Bjork has been president since 1952. As chairman of the board he succeeds **James F. Oates, Jr.,** who is scheduled to become president of Equitable Life Assurance Society, June 1.

Paul T. Davis, assistant superintendent of the gas contract and measurement division of Sinclair Oil & Gas Co.'s Tulsa gas and gas products department, has been promoted to superintendent. He succeeds **S. J. Fraser,** recently appointed to the Federal Power Commission activities section of the legal department.

C. S. Killgore has been promoted by Continental Oil Co. to assistant southern regional geologist, Houston. He was formerly division geologist in New Orleans. Killgore succeeds **M. B. Morris,** recently promoted to assistant manager of the company's headquarters geological section in Houston. **T. M. Anderson,** district geologist in New Orleans, has been named division geologist in Shreveport. Killgore has been with Conoco since 1946, Anderson since 1951.

James Space, head of the equipment group, mechanical engineering department, at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., has been appointed process training coordinator for chemical and petroleum products departments. **Robert Bowman,** paranox unit supervisor in the additives department at Bayway, will succeed Space in the equipment group. **Lee Prochazka,** head of the additives group in process engineering, will succeed Bowman in the additives department. **Robert Swick** has been transferred from the alcohol and white oil department to replace Prochazka. Space has been with Esso since 1947. Bowman joined the company in 1945, Prochazka in 1951, and Swick in 1948.

Graham E. Little, H. D. Barger, Jr., and **James M. Mills** have joined Standard Oil Co. (Ind.) at the company's Whiting, Ind., research laboratories.

Jack B. McCarty, engineering trainee with Sohio Petroleum Co., has been transferred to Oklahoma City from Elmore City, Okla.

G. D. Simon, production manager with McRae Oil & Gas Corp., has been transferred to Denver from Midland, Tex.

Leonard Simmering, petroleum engineer with Eason Oil Co. in Oklahoma City, has joined Keating Drilling Co. as production superintendent in Guymon, Okla.

Irene Haskett, formerly with Core Laboratories, Inc., in Dallas, has joined H. J. Gruy & Associates there as a reservoir specialist. A University of Oklahoma graduate petroleum engineer, she was with Carter Oil Co. and Imperial Oil, Ltd., before joining Core Laboratories.

Charles Weisel, diesel-fuel group head for Esso Research & Engineering Co. at Linden, N. J., has been appointed head of the aviation and diesel-fuels section in products-research division. He succeeds **Ben Geddes,** recently named assistant director of the division.

Drilling & Exploration Co., Inc., of Houston and its subsidiary, Drilling & Exploration Co. of Delaware, Inc., Los Angeles, will move their headquarters to Dallas July 1. **Charles R. Rider,** president of Drilexco, is already in Dallas. Transferring from Los Angeles to Dallas will be **R. L. Rose,** president of Drilexco of Delaware; **Robert D. Walker,** vice president, and **H. D. Pyke,** manager of field operations of the subsidiary. Moving from Houston will be **E. A. Roberts, Jr.,** Drilexco vice president and production manager, and his staff.

Dr. V. Dean Allred has joined Ohio Oil Co.'s Denver research center as advanced research technologist in engineering. Allred formerly was with Houdry Process Corp., Catalytic Construction Co., and Union Carbide Nuclear Co. **Dr. Robert H. Reitsema,** chief chemist with A. M. Todd Co., has joined Ohio as senior research technologist in the chemistry section, Denver. **Dr. Charles H. Hewitt,** formerly field geologist with Sun Oil Co., and **Dr. David B. MacKenzie,** formerly with American Overseas Petroleum, Ltd., have joined the company as research geologists.

James E. Scarborough, production foreman with Paul C. Teas in Hamlin, Tex., has been transferred to Post, Tex.

B. J. Brown, production engineer for McRae Oil & Gas Corp. in Oklahoma City, has been transferred to Midland, Tex.

W. M. Shilliam has been named assistant regional manager in Los Angeles for Standard Oil Co. of California, Western Operations, Inc.

Donald L. Berry, party chief with Phillips Petroleum Co., has been transferred to Sharon Springs, Kans., from Larned, Kans.

Lee A. Adams, Jr., petroleum engineer senior grade with Pan American Petroleum Corp., has been transferred to Tulsa from Midland, Tex.

E. L. GORHAM

Edwin L. Gorham, Jr., assistant manager of The Texas Co.'s foreign operations department, producing division, has been promoted to manager of the foreign producing division. Gorham has been with Texaco since 1932 and has been assistant manager of foreign operations' producing division since 1956. **Landon B. Derby,** manager of the company's foreign sales division, has been appointed assistant general manager of the foreign operations department (Western Hemisphere and West Africa). **Henry Hanbury,** assistant manager of the foreign sales division, will succeed Derby as manager.

W. R. Smith, assistant supervisor of chemicals research at The Texas Co.'s Port Arthur-Port Neches, Tex., laboratories, has been named technical assistant with Texaco Development Corp. at the company's Port Arthur research laboratories.

Ronald L. Harris, petroleum engineer in Calgary with Sinclair Canada Oil Co., has joined Northern Natural Gas Producing Co. as production engineer, Calgary.

Rein de Wit, Sohio Petroleum Co.'s Calgary district geologist, has been promoted to senior research geologist. **Thomas Parks,** senior geologist, has been named to succeed de Wit as Calgary district geologist.

Personals

I. J. Anderson, division geologist and manager of Gulf Interstate Gas Co.'s Lafayette, La., office, has been named a vice president. He will maintain headquarters in Lafayette.

Eldon House, district geologist in Cody, Wyo., with Husky Oil Co., has opened consulting offices there.

Albert Spangenberg, 65, has retired as deputy chairman of Esso A.G. in West Germany after nearly 45 years with the company.

Thomas Camilli has joined Esso Research & Engineering Co.'s products research division, Linden, N. J.

H. Aubrey Clay, process consultant with Phillips Petroleum Co. in Phillips, Tex., has been transferred to the company's research and development department in Bartlesville, Okla.

Kenneth L. Smith, vice president of Ambassador Oil Corp., Fort Worth, has been made head of the company's new operating division, formed from consolidation of the water-flood operations and production departments. **Robert L. Young,** chief production clerk, has been named assistant to the vice president of operations. **James W. Vater,** district production superintendent in Oklahoma City, has been transferred to Fort Worth as superintendent of primary producing operations, and **William R. Banks,** district production engineer in Abilene, will move to Oklahoma City as district production superintendent replacing Vater. **Russell Meyers,** formerly with Warren Petroleum, has joined Ambassador at Abilene as district primary production engineer. **Fred H. Thomas,** district superintendent for Great Lakes Carbon Corp. at Evansville, Ind., has joined Ambassador as field superintendent in the Abilene area. In other appointments, **E. A. Riley** has been promoted from North Texas waterflood district supervisor, Jacksboro, Tex., to superintendent of secondary-recovery operations in Fort Worth. **B. J. Kellenberger,** water-flood acquisition engineer in Roswell, N. M., has been transferred to Fort Worth and promoted to chief engineer, secondary-recovery operations.

Charles F. Guinn, superintendent of Tidal Pipe Line Co., and **Otis R. Tisdale,** chief engineer, have retired. Guinn joined Tidal in 1927, Tisdale, in 1929.

Robert R. Williams has joined Canadian Bishop Oil, Ltd., as a geologist in Calgary.

Jackson W. Wisner, Jr., has joined The Texas Co. as chemist at the company's Beacon, N. Y., research center.

John M. Taylor, Jr., has been named chemist in Pan American Petroleum Corp.'s corrosion and general chemistry group in Tulsa.

Seymour G. Hootkins, executive vice president of Ryan Consolidated Petroleum Corp., has resigned to become an independent operator in Dallas.

Royes Salmon has joined Houdry Process Corp.'s engineering department as senior process engineer.

Albert Pierce has been transferred to Hobbs, N. M., from Midland, Tex., by Casper Drilling Co.

Thomas M. Burke, geologist with John W. Mecom, has been transferred to Houston from New Orleans.

James L. Walker, formerly in the technical service division of Humble Oil & Refining Co.'s Baytown, Tex., refinery, has joined Purvin & Gertz, Inc., Dallas consulting engineering firm, as staff consultant specializing in refining and petrochemicals.

D. E. Perriman, Shell Oil Co. exploration engineer in Houston, has been named production geologist there.

Robert E. Swarbrick has joined Esso Research & Engineering Co.'s process research division at Linden, N. J.

Richard L. Englum, engineer with Ohio Oil Co., has been named pipeline engineer and transferred to Findlay, Ohio, from Casper, Wyo.

George H. Silkworth, corrosion engineer with Ebasco Services, Inc., in New York, has joined Pacific Northwest Pipeline Corp. as corrosion engineer in Salt Lake City.

Jack Newcombe has been transferred from Cities Service Research & Development Co.'s Tulsa laboratory to New Orleans as research coordinator for Petroleum Chemicals, Inc.

J. L. Adkins, formerly district production foreman for Pan American Production Co. in Grand Chenier, La., has been appointed head roustabout for Pan American Petroleum Corp. and transferred to Hackberry, La.

R. Earl Kirberger, Service Drilling Co., has been elected president of the Tulsa Petroleum Club. He succeeds **Herman H. Kaveler,** petroleum engineering and management consultant. Other new officers are **Lawrence J. Zoller,** Central Commercial Co., vice president; **Kenneth A. Ackley,** Carter Oil Co., secretary; and **H. E. Dunlap,** Tidewater Oil Co., treasurer.

DEATHS

Charles F. Johnson, 95, pioneer San Joaquin Valley, California, oil man, died April 1 at his home in Fresno, Calif. Johnson was manager of Kern River Oil Co. 35 years before his retirement.

Herman Aweas, 54, Tulsa, vice president in charge of drilling with Helmerich & Payne, Inc., and vice president of White Eagle Oil Co., died April 4 in Tulsa. Aweas had been with Helmerich & Payne 23 years.

Basil R. Jackson, 64, former chairman of British Petroleum Co., Ltd., died March 29. He had retired from BP in January because of poor health. Jackson joined Anglo-Persian Oil Co., forerunner of BP, in 1921. He succeeded Lord Strathalmond as chairman last year.

Charles E. Davis, 54, district landman at Amarillo, Tex., for Pure Oil Co., died April 3 in Amarillo. Davis had been with Pure since 1924. He was a past president of the Panhandle Petroleum Landmen's Association.

Robert Rushing, 37, Sinclair Oil Co. engineer in Tulsa, died April 10 in Tulsa after a heart attack. Rushing had been with Sinclair since 1953. Before that time he was with Skelly Oil Co.

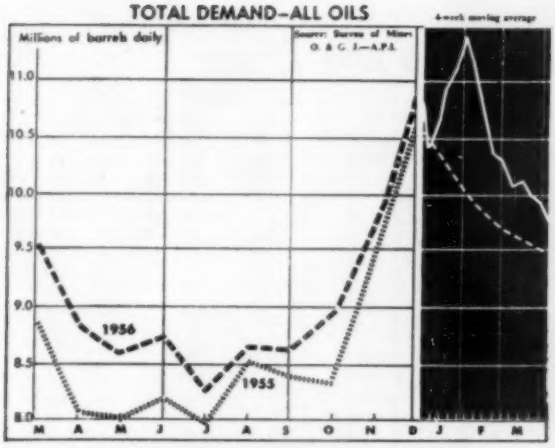
Gorman Staton Williams, 58, of Tulsa, inventor of a hydraulic jack used for oil-field pumping, died April 4 in Borger, Tex., while on a business trip.

George C. Terry, 57, retired president of Terry Drilling Co., died April 2 in Los Angeles.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,631,400	DOWN	165,625	UP	465,961
Crude stocks	252,309,000	DOWN	933,000	DOWN	11,514,000
Completions	962	UP	65	DOWN	157
Refinery runs	7,856,000	DOWN	243,000	UP	339,000
Gasoline stocks	203,310,000	DOWN	179,000	UP	5,988,000
Kerosine stocks	19,729,000	DOWN	439,000	UP	2,085,000
Distillate stocks	75,295,000	DOWN	560,000	UP	14,487,000
Residual stocks	37,594,000	UP	496,000	UP	4,943,000
Four-product stocks	335,928,000	DOWN	682,000	UP	27,503,000



Gasoline and Distillate Stocks Have Been Higher in Terms of Days' Supply

GASOLINE and middle-distillate stocks are a little too high for this time of year, but the market reaction has been out of proportion to the stock excess.

Current weekly reports show gasoline stocks at the end of March only about 3 million barrels above actual stocks at the end of the first quarter last year. Of course, the joker in the deal is the fact that stocks were up about 15.7 million barrels last year.

For the past several years gasoline stocks at the end of the first quarter have grown by spurts. From 1953 to 1954 the increase was almost 20 million barrels. The following year's gain was only 2.7 million, followed by the big 15.7-million jump in 1956. This is the year for a small net increase.

Gasoline stocks normally increase through March of each year and then start the seasonal drop in April. Current A.P.I. stock reports show a reduction of about a million barrels in March this year.

Part of the March reduction was due to the slight cut in refinery runs. However, many suppliers contend that the reduction was too small, considering refined-products-stock levels.

Some of the pressure on gasoline markets this spring has been due to the fact that a few suppliers have not added storage to cover normal increases in production and demand. Bigger markets call for more storage space.

Total gasoline stocks at the end of March amounted to almost 203 million barrels. This was higher than any previous March stock level and also higher than any past month except February of this year.

However, if consideration is given to stock gains made necessary by higher demands, the actual surplus is not too serious. If the gasoline-stock total for the end of March each year is divided by the daily average demand for gasoline during the year, the following ratios result: 47.4 for 1953; 52.3 for 1954; 49.1 for 1955; 51.7 for 1956; and 49.8 for 1957. (Total gasoline demand for this year is forecast at 4,064,000 bbl. daily).

In terms of days' supply, gasoline stocks for March this year dropped below the records for both 1954 and 1956. The drop of 2.5 days' supply from the record of 52.3 in 1954 takes on more significance when compared with the maximum seasonal drop of 9.1 days' supply between March and September

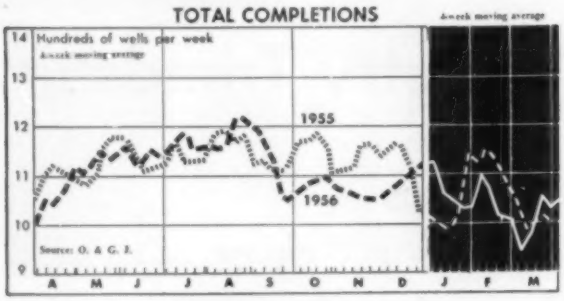
The middle-distillate stock total for the end of March, expressed in terms of days' supply, was close to the median for the past 5 years. March stocks this year represented 42.6 days' supply compared with 42.2 for the median year 1954.

The middle-distillate total, measured in barrels, was up this year, but there had been very little change in March stocks since 1953. Total middle-distillate stocks for March 31, 1956, amounted to 78.1 million barrels compared with 77.8 million for the same date in 1953.

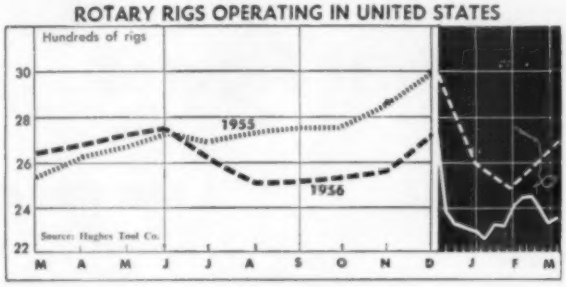
Higher octane gasoline . . . Great Lakes Pipe Line Co. will begin moving 98-octane premium gasoline May 1. The company had announced late in March that premium would be moved up to 97 octane and regular to 89 octane on April 15.

In its latest announcement, the company said that 97-octane premium would be accepted after May 1 for consignment to terminals where facilities are adequate and volumes offered are large enough to permit handling.

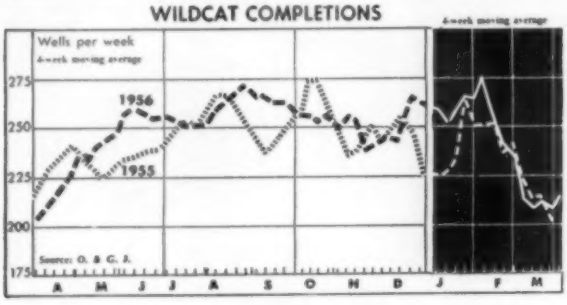
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	4-8-57	4-1-57	4-9-56
North Central and East	71	72	107
Southeast	47	35	33
Okla., Kans., Ark., Mo.	347	353	510
Louisiana	416	413	429
North and East Texas-Panhandle	416	388	435
Gulf and South Texas	225	227	271
West Texas-New Mexico	555	545	547
Rocky Mountain	192	199	219
Pacific Coast	92	95	131
Total United States	2,361	2,327	2,682
Western Canada	130	181	125

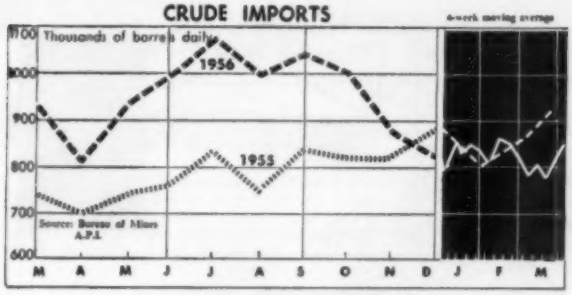
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 6, 1957

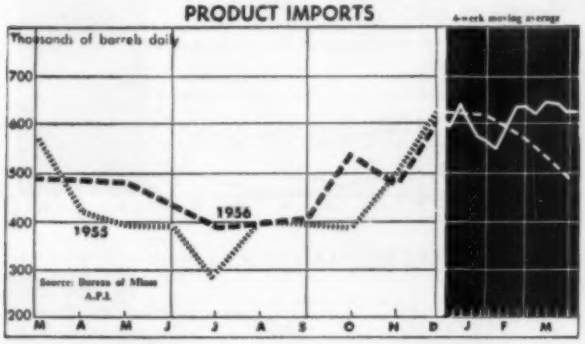
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.†*	8	4	1	3	67,042	30	26	0	0	1	3	4	0	0	1	12	13
Arkansas	17	10	0	7	44,320	275	199	0	0	0	4	4	5	0	1	36	42
California	42	30	1	11	169,048	516	564	2	0	0	9	11	12	0	2	122	136
Colorado	11	5	0	6	58,581	267	292	2	0	0	5	7	10	0	3	167	180
Illinois	54	16	0	38	112,738	624	866	0	0	0	19	19	7	0	1	148	156
Indiana	12	3	0	9	18,315	162	163	0	0	0	5	5	3	0	0	30	33
Kansas	85	34	11	40	314,853	1,175	1,338	2	0	1	21	24	34	0	8	170	212
Kentucky	22	4	7	11	44,756	376	446	0	0	1	5	6	9	0	2	72	83
Louisiana	62	31	7	24	528,520	1,015	1,018	3	0	2	9	14	25	9	26	118	178
North	18	13	1	4	57,700	373	373	0	0	0	1	1	3	0	2	37	42
South	30	13	3	14	325,601	460	517	3	0	1	5	9	15	8	19	68	110
Offshore	14	5	3	6	145,219	182	128	0	0	1	3	4	7	1	5	13	26
Michigan	3	1	0	2	6,595	100	136	0	0	0	1	1	4	0	0	41	45
Mississippi	12	6	0	6	77,918	90	115	2	0	0	3	5	7	0	0	34	41
Montana	6	4	0	2	41,194	80	93	0	0	0	1	1	2	0	0	26	28
Nebraska	21	5	0	16	117,939	214	232	2	0	0	10	12	12	0	0	108	120
New Mexico	42	30	5	7	185,474	527	465	1	0	0	3	4	21	1	5	55	82
Northwest	9	3	5	1	32,310	196	152	0	0	0	1	1	10	1	4	17	32
Southeast	33	27	0	6	153,164	331	313	1	0	0	2	3	11	0	1	38	50
New York	9	4	0	‡5	9,250	122	.....	0	0	0	0	0	0	0	0	0	0
North Dakota	5	3	0	2	29,047	84	59	0	0	0	1	1	4	0	0	29	33
Ohio	20	7	4	§9	52,596	286	285	0	0	0	0	0	0	0	0	3	3
Oklahoma	125	73	3	‡49	424,197	1,789	2,339	1	0	1	15	17	29	6	4	164	203
Pennsylvania	6	0	4	2	38,787	307	*212	0	0	1	2	3	0	0	10	18	28
Texas	371	231	18	122	1,631,294	5,755	5,750	4	2	5	73	84	173	11	63	1,323	1,570
Southwest (1 & 4)	53	24	4	25	220,684	661	857	1	0	0	15	16	23	2	19	205	249
Gulf Coast (2 & 3)	45	20	8	17	300,078	681	720	0	2	3	10	15	14	6	32	185	237
East (5 & 6)	22	10	0	12	117,034	335	306	0	0	0	8	8	4	0	2	94	100
N. Central (7-B & 9)	109	56	3	50	296,899	2,086	1,975	3	0	2	31	36	91	0	5	593	689
West (7-C & 8)	107	90	0	17	566,325	1,630	1,579	0	0	0	9	9	39	0	4	225	268
Panhandle (10)	35	31	3	1	130,274	362	313	0	0	0	0	0	2	3	1	21	27
Utah	5	1	1	3	30,510	43	19	0	0	1	3	4	3	0	2	23	28
West Virginia	10	3	7	0	17,242	170	190	0	0	0	0	0	0	0	7	2	9
Wyoming	14	6	0	8	53,680	215	193	0	0	0	5	5	9	0	2	69	80
Miscellaneous	0	0	0	0	0	19	49	0	0	0	0	0	0	0	1	13	14
Total United States	**962**	511	69	382	4,073,896	14,241	15,049	19	2	13	197	**231**	369	27	138	2,783	3,317
Total previous week	897	463	80	354	3,834,302	.....	.....	24	1	12	174	211	350	25	125	2,586	3,086
Total April 7, 1956	1,119	669	69	381	4,667,394	.....	.....	29	1	6	186	222	422	46	98	2,744	3,310
Cum. 1957	14,241	7,545	1,076	5,620	58,994,382	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Western Canada	62	43	1	18	271,966	729	634	2	0	0	14	16	17	0	16	169	202

*Incl. N. Y. †Incl. Fla. 1, dry, 6,896 ft. Service wells included: ‡5, §3.

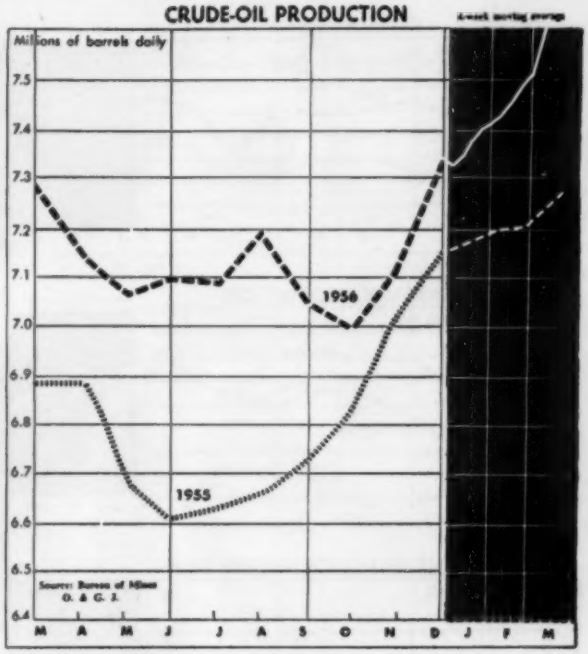
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

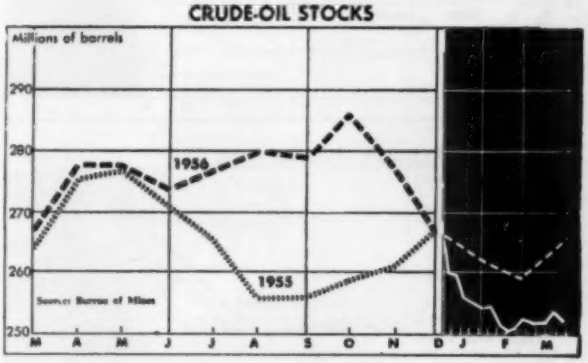


DAILY AVERAGE PRODUCTION FOR WEEK

	April 6, 1957			Mar. 30
	Crude oil	Lease condensate	Total	total
Alabama	11,750	.....	11,750	11,700
Arkansas	83,200	300	83,500	83,500
California	937,000	.....	937,200	937,800
Colorado	158,750	.....	158,750	158,700
Eastern	50,200	.....	50,200	51,600
Florida	1,225	.....	1,225	1,250
Illinois	226,500	.....	226,500	228,500
Indiana	32,200	.....	32,200	31,700
Kansas	†291,700	.....	†291,700	†343,300
Kentucky	47,500	.....	47,500	47,600
Louisiana	895,425	74,600	970,025	1,014,850
North	129,000	3,100	132,100	128,900
South	766,425	71,500	837,925	883,250
Michigan	27,800	.....	27,800	27,400
Mississippi	109,800	4,900	114,700	114,150
Montana	70,500	.....	70,500	72,650
Nebraska	38,650	.....	38,650	37,850
Nevada	100	.....	100	100
New Mexico	267,475	5,200	272,675	267,975
North Dakota	40,700	.....	40,700	43,700
Oklahoma	†696,600	.....	†696,600	669,900
Texas	3,186,275	55,250	3,241,525	3,333,000
Dist. 1	56,275	475	56,750	57,550
Dist. 2	157,575	8,750	166,325	172,900
Dist. 3	448,275	26,300	474,575	485,300
Dist. 4	247,275	6,600	253,875	259,600
Dist. 5	42,575	400	42,975	44,475
Dist. 6	215,775	.....	215,775	153,200
East Texas Field	142,000	6,000	148,000	229,000
Dist. 7-B	169,425	75	169,500	173,100
Dist. 7-C	172,425	4,225	176,650	180,300
Dist. 8	1,211,875	1,400	2,213,275	1,255,425
Dist. 9	214,575	700	215,275	216,850
Dist. 10	108,225	325	108,550	105,300
Utah	14,000	.....	14,000	13,300
Wyoming	303,500	.....	303,500	306,400
Others	‡100	.....	‡100	‡100
Total U. S.	7,491,150	140,250	**7,631,400**	7,797,025
Change from prev. week, down			**165,625**	.....
Canada	†498,800	.....	†498,800	†531,000
Total U. S. prod., January 1-April 6				§729,061,275 bbl.
Same period last year (crude plus cond.)				*700,804,635 bbl.

*Includes 12,635,705 bbl. condensate. †Week ended previous Monday. ‡South Dakota. §Revival.

CRUDE-OIL STOCKS



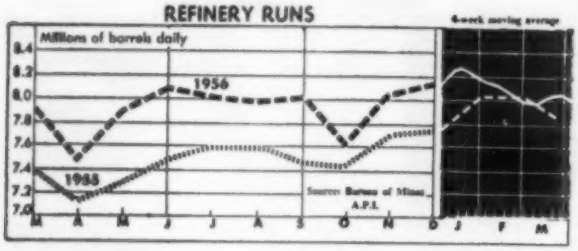
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

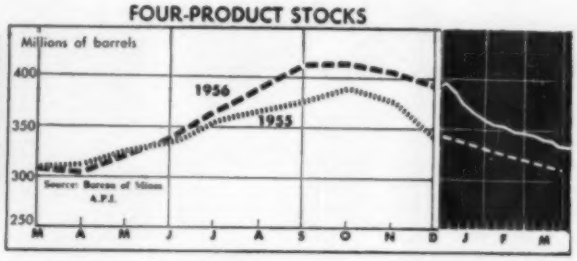
	3-30-57	3-23-57	3-31-56
Pennsylvania Grade	2,503	2,527	2,588
Other Appalachian	1,963	2,044	2,161
Illinois, Indiana, Michigan	9,580	9,073	9,174
Nebraska, North Dakota	2,029	1,915	2,018
Kansas	9,000	9,015	7,792
Oklahoma	21,722	22,122	23,440
Arkansas	2,467	2,529	2,632
Louisiana	17,806	18,630	16,410
North	2,872	2,840	2,594
South	14,934	15,790	13,816
Mississippi	2,103	2,133	3,138
New Mexico	6,841	7,386	7,674
Texas	115,329	114,281	123,685
East Texas proper	10,719	10,778	9,345
West Texas	53,902	53,227	60,770
Texas Gulf	21,938	21,841	21,746
Other Texas	28,770	28,435	31,824
Wyoming	16,615	17,043	15,921
Other Rocky Mountain	5,926	6,182	5,586
California	26,101	26,686	27,976
Foreign	†12,324	11,676	11,871
Total	252,309	253,242	262,066

*Bureau of Mines. †Includes 2,784,000 bbl. in California.

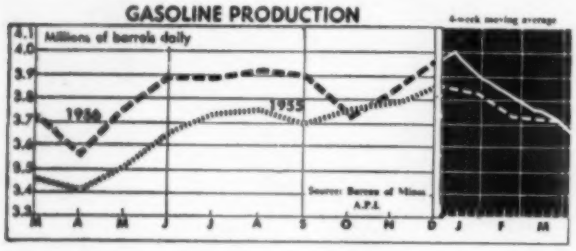
REFINERY RUNS



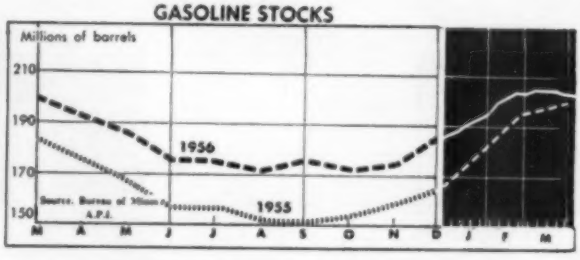
FOUR-PRODUCT STOCKS



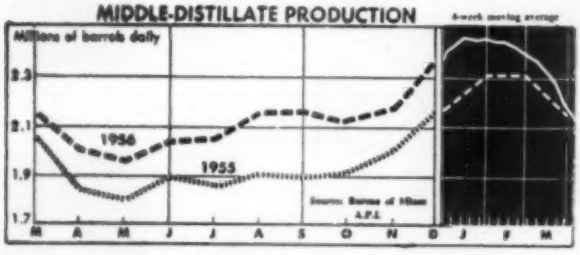
GASOLINE PRODUCTION



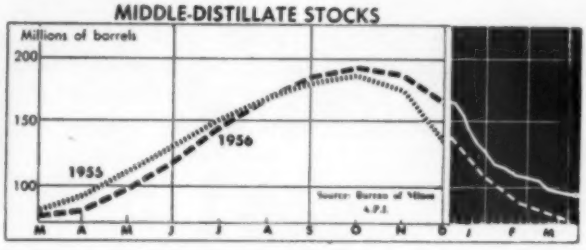
GASOLINE STOCKS



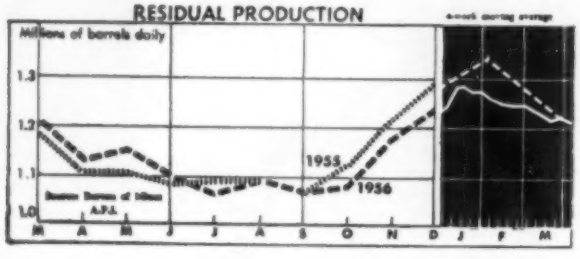
MIDDLE-DISTILLATE PRODUCTION



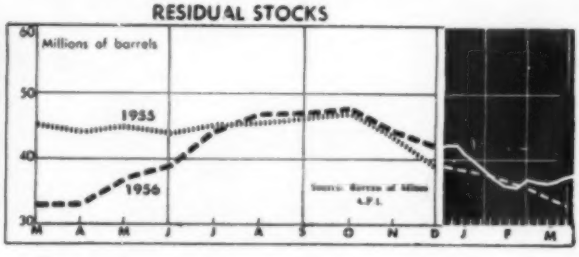
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, APRIL 5, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1956 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,217	497.4	27.0	356.0	213.8	43,039	8,343	23,239	8,355	1,027	417.0	30.2	285.3	196.1
Appalachian:														
District 1	99	38.0	5.0	19.3	7.1	4,951	467	1,834	417	94	36.5	4.3	21.5	6.3
District 2	90	45.9	7.3	19.3	10.6	3,131	380	611	346	100	48.7	6.4	15.7	14.0
Ind., Ill., Ky.	1,339	708.3	62.0	289.3	154.1	37,345	3,560	11,881	4,774	1,333	674.4	77.0	257.8	172.0
Minn., Wis., Dak.	100	46.6	7.9	30.7	8.7	6,773	323	3,377	398	80	37.3	3.7	20.9	5.8
Okla., Kans., Mo.	666	343.3	14.8	140.3	28.9	21,057	829	7,411	790	604	307.5	12.4	141.6	29.5
Inland Texas	243	189.9	4.0	51.2	21.9	8,115	252	1,393	1,724	246	185.2	9.2	46.3	28.3
Texas Gulf Coast	1,967	838.8	73.3	486.4	253.4	27,050	2,653	8,345	5,316	1,958	925.0	93.8	523.8	244.8
La. Gulf Coast	646	283.1	52.1	152.4	33.1	11,532	1,506	4,736	1,481	678	337.1	52.1	161.7	47.8
N. La. and Ark.	96	36.1	8.4	20.7	7.1	4,806	865	1,356	207	60	20.4	1.9	17.8	2.5
Rocky Mountain:														
New Mexico	28	13.3	0.6	5.0	3.4	394	11	84	69	24	12.9	0.3	4.3	3.0
Other Rocky Mtn.	240	117.3	2.6	60.6	32.0	8,150	248	2,437	1,061	227	103.2	2.3	55.5	32.0
California	1,125	511.0	3.6	173.7	404.0	26,967	292	8,591	12,656	1,056	452.1	5.6	160.7	347.6
April 5, 1957	7,856	3,669.0	268.6	1,804.9	1,178.3	203,310	19,729	75,295	37,594	7,487	3,557.3	299.2	1,712.9	1,129.7
March 29, 1957	8,099	3,715.3	310.0	1,756.6	1,235.9	203,489	20,168	75,855	37,098	.....	.....	.....	.....	.....
April 6, 1956	7,517	3,654.1	334.6	1,739.1	1,079.9	197,322	17,644	60,808	32,651	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.75-12.25
Premium (96 octane)	13.50-14.00
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	13.00-13.50
Premium (98 octane)	13.25-13.75
California (rack):	
Regular (86 octane)	13.1
Premium (93 octane)	14.1
Premium (96 octane)	15.1
Caribbean area (cargoes):	
Regular (87 octane)	11.00
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00-10.375
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	9.00-9.375
Gulf Coast (cargoes):	
Kerosine 41-43	10.50-11.00
Distillate No. 2	10.00-10.50
New York Harbor (barges):	
Kerosine 41-43	12.25
Distillate No. 2	11.65
Diesel fuel, 48-52 d.i.	11.95
Caribbean area (cargoes):	
Distillate No. 2	10.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid) in bags or barrels	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$2.25-2.35
Gulf Coast (cargoes):	
Bunker C fuel	$2.75-3.00
New York Harbor (barges):	
Bunker C fuel	$3.30-3.40
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.75-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.89
16-16.9	2.74	....	....	....	1.94
17-17.9	2.78	....	....	....	1.99
18-18.9	2.82	....	....	....	2.04
19-19.9	2.85	....	....	....	2.09
20-20.9	2.89	$2.75	....	$2.62	2.14
21-21.9	2.93	2.77	....	2.64	2.19
22-22.9	2.97	2.79	....	2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low Cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.78
Redwater (Alta.)	2.67
Smiley (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC+25%)	$3.62
★ N.W.I.-U.S.N.H., dirty (USMC+15%)	3.11
★ N.W.I.-U.K., dirty (USMC—5%)	6.22
★ P.G.-Japan, dirty (USMC+17.5%)	10.58

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY... CLASSIFIED ADVERTISING

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FOR SALE—Used—10' x 40' 24,000 gal. horizontal steel riveted and welded gasolene storage tanks, three at Tallant, Oklahoma, $1,000.00 each, seven at Wichita gasolene plant, $650.00 each. Cities Service Oil—Patridge—Bartlesville.

FOR SALE: 600 tons Carnegie MP-115 42 ft. & Larssen Section II 30 ft. and 40 ft. lengths steel sheet piling located New Orleans and Tampa. Seaboard Steel Company, Tel. RIngling 7-0461, Sarasota, Florida.

USED EQUIPMENT—FOR SALE

127' LEE C. MOORE MAST—Series #127—5 Sheave Crown, Bolt Type with 4' and 3' Substructures. In excellent condition.

UNIT 10 DRAW WORKS with Air, Series 81, Compound and Drilling Line.

5x10 MUD PUMP with Model U9 International Motor—also equipped with 3" Bronze Liners for Salt Water Disposal Pump.

Call or Write:

THE OKLAHOMA COMPANY
412 Hales Building Phone REgent 6-7526
Oklahoma City, Oklahoma

CLARK BROTHERS—Model HMA6 angle unit complete with Young cooler and all fittings. Six power cylinders 8¼ x 8¼, 265 hp at 600 rpm. Gas cylinders, two 14½ and one 10½. Capacity 1,500,000 CFD at 0# suction. Practically new condition immediately available and priced at a bargain.

COOPER-BESSEMER—Model GMXA angle compressor complete with Young cooler and all fittings. Four power cylinders 9¾ x 10½. 250 hp at 400 rpm. Two gas cylinders, one 20" and one 10¾". Capacity 1,500,000 CFD at 0# suction. This unit used very little and practically new.

CARSON MACHINE AND SUPPLY COMPANY

Oklahoma City, Okla. Great Bend, Kans.
Tulsa, Okla. Garden City, Kans.

NEW GAS COMPRESSOR AVAILABLE FOR SALE

Electrically operated, of the following specifications:

Chicago Pneumatic Simplate Valve Gas Compressor, Serial No. 55045.
Size 12—12 x 7 Y D E
Direct connected to Allis-Chalmers Induction Motor NENA
Design Type AZZ—24 hrs., 150 H.P., 4,000 Volt, 3 phase, 60 cycle, 585 R.P.M.
Serial Number 1-5128-71084-1-1, 55° C rise.

Offers should be directed to the

SCRANTON SPRING BROOK WATER SERVICE COMPANY
30 North Franklin Street
Wilkes-Barre, Pa.

Unit can be inspected at the Generating Plant of the
SUNBURY GAS WORKS, Sunbury, Pa.

FOR SALE

Line Pipe, 25,000' 2¼" OD, Seamless RML B/E, ready for welding, at a very low price. Immediate delivery, excellent for water, air, oil, or gas lines, also fence posts and many other structural uses.

A. J. STRUBEL

4946 MURDOCH

ST. LOUIS 9, MISSOURI

FOR SALE EQUIPMENT

PRICED TO SELL. Hydraulic pipe pulling unit, two speed 6' jacks, spiders, slips, arch bars, sill, breakout tongs, 4 cylinder displacement pump etc. All on '47 2-Ton Dodge Truck. All in good shape and ready to work. Phone S.H. 6-4016, J. E. Bedingfield. Box 563, Artesia, N. M.

FOR SALE EQUIPMENT

FOR SALE—Cardwell Spudder, RL502, complete with tools, equipment necessary for efficient operation. Price, inventory on request. K & A Drilling Co., Phone 448R, Box 497, Ellinwood, Kansas.

4000' RIG FOR SALE. SM 4000, single drum, truck mounted Franks drilling rig; 60' Franks 4 legged derrick; D-175 Emsco (6¾-12) pump, powered by GMC 6-110A Diesel; drawworks powered by 671 GMC diesel, torque converter; dog house-tool house, float mounted; air conditioned aluminum "Travelite" trailer house, 3½" API modified drill pipe, 7000'; hand tools, subs, 2 light plants, 2 water pumps, 2 5⅝" drill collars. Complete inventory on request. Write Petro-Tex Oil Corp., 900 N.E. Military Dr., San Antonio, Texas. TA 4-2377.

LIQUIDATION 11,000 BBL. REFINERY

D-X SUNRAY OIL CO., ALLEN, OKLA.

We are now liquidating this modern refinery and can offer equipment at a fraction of its cost.

INCLUDED ARE: 6 Heaters with Chrome Tubes, Welded Towers from 2' to 8' with Operating Pressures up to 475 psi., Reboilers, Accumulators, Heat Exchangers, Hot Oil Pumps, Centrifugal and Steam Pumps, Boilers, Gas and Diesel Generator Sets, New Chrome Heater Tubes, Pipe, Valves, etc.

Your Inspection Is Invited. Write for Catalogue.

HEAT & POWER CO. Inc., **60 E. 42 St., New York 17, N. Y.**
310 Thompson Bldg., Tulsa 3, Okla.

BRILL BUYS—THE BEST!

NEAR LONGVIEW, TEXAS

FORMER LACY REFINERY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant.
2—Upshot heaters, 10 mil. BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.

IN STOCK

VESSELS

2—12' x 45' Butane Tanks, 125#
2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 25' Tanks 50#
5—Packed Towers 14" x 40', 18" x 23', 160# Wyatt 1950.
1—Poly Reactor, 550#, 24" x 28'.

HOT-OIL PUMPS

3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—316' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' Hd.
8J hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

HEAT EXCHANGERS

4—Kellogg Adm. Flg. Hd. 2200, 1300 Sq. Ft., 315#
4—Kellogg Stel Flg. Hed. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome.
5—Steel 1,000, 900, 800, 600, 500 Sq Ft.
6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 100-1000 Sq. Ft.

COMPRESSORS

1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 lbs.
385 CFM 160 lbs.

MISCELLANEOUS

6—Bird Centrifugals 32 x 50, 24 x 36, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
Lab Petro-Chem furnace 50,000 BTU/hr.
Tremendous selection stainless steel and steel valves 1½"-6".
Goulds 16" pump, 10,500 gpm, 135' hd.

PARTIAL LIST ONLY

WIRE! PHONE! WRITE!
FOR DETAILED CIRCULAR

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, JA 6-1351
OR
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

FOR SALE EQUIPMENT

FOR SALE: Used Unit U-30 Drawworks complete, Mid-Continent Model 6240 Swinging Compound, and Four LRIG-600 Cummins Gas Engines with Series 16000 Twin Disc Torque Converters. Inquire Box K-110, The Oil and Gas Journal, Tulsa, Oklahoma.

3500' WILSON Super Rotary Rig with telescopic double mast complete with all equipment, including 3,000' of drill pipe. Excellent condition. Presently in operation. Box K-112, The Oil and Gas Journal, Tulsa, Oklahoma.

Stop Tong Breakage!

ARMITE DRILL COLLAR & TOOL JOINT COMPOUND

Armite Labs., 6609 Broad. St., Los Angeles 1, Calif.
Petro. Industries Consultants, C.A. Caracas, Venez.

FOR SALE EQUIPMENT

PRICED TO SELL: Used 8" x 20" Gardner-Denver FH-FXL Power Slush Pumps. Details furnished upon request. Write Box K-109, The Oil and Gas Journal, Tulsa, Oklahoma.

COMPLETE PIPE-THREADING shop. Two Landis machines 13⅜" and 7", with building, fully equipped. Bargain. Phone Diamond 3-9563. Lundquist, Box 1215, Tulsa, Oklahoma.

FAILING 1500 H.D. drill with 4½x6 pump, automatic pulldown, mounted on 1948 F7 Ford. Also Griffin water tank, mounted on 1951 Ford. Write P. O. Box 819, Longmont, Colorado. Phone 1333.

N-3 BREWSTER Drawworks complete with 1 GZBU Waukesha 20 months old—excellent condition. Price $13,750.00. 1—6 x 12 P Oilwell Pump unitized with WAKBU Waukesha 20 months old—excellent condition. Price $13,250. Contact: IVERSON SUPPLY COMPANY, Odessa, Texas. Phone: FEderal 7-2349.

FOR SALE EQUIPMENT

ROTARY ON TRUCKS: Cheap. Cash-Terms. 2000' 4½" pipe, 7¼ x 10 GD pump, Hydraulic Mast, good 2-3 MFT Wells. Send me your requirements. Box K-134, The Oil and Gas Journal, Tulsa, Oklahoma.

SMALL FAILING rotary or coring drill. Truck-mounted, with pump, some equipment. Reasonable. Contact: Bob's Carter Service, 1325 First Avenue North (Phone 9-0848) Billings, Montana.

FOR SALE: Two type X Bessemer twin compressors complete with Braden steel building and all connections. Alfred B. Kern, 305 Kennedy Building, Tulsa, Oklahoma.

FOR SALE OR TRADE, complete steam rig less drill pipe near Beaumont, Texas. Will take royalty or production payment. Box K-130, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE at below our cost. BRAND NEW approximately 1360 feet of 2⅞ J-55 tubing joints. Lengths range from 23 to 25 feet. Price $2 a foot. Call Ralph Varel, FL 1-6487, Varel Mfg. Co., 9230 Denton Dr., Dallas.

32 DRILL COLLARS, 20 ft. OD, 5", ID 2 in., 41-40 heat-treated steel, BRAND NEW. $300 each. Ask for Ralph Varel. FL 1-6487, Varel Mfg. Co., 9230 Denton Dr., Dallas.

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son. Pueblo, Colo.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

C-34 WALKER-NEER Spudder, with or without 5-7 tools. A-1 condition. Fully equipped. Located at Drumright, Oklahoma. Box 788 or phone 20, Drumright.

BESSEMER GAS COMPRESSORS—3 type 10 twins direct connected units—Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

GAS METERS FOR SALE: Foxboro and Westcott Orifice Meters, Large Stock of Late Types and in Good Condition. George Milner, Box 124, Okmulgee, Okla.

LIQUIDATION—Drumright, Okla.

TIDEWATER OIL COMPANY

Modern 15,000 Bbl./Day Refinery

Presently being dismantled — Immediate removal and shipment — exceptional prices

HOUDRIFLOW CATALYTIC CRACKING UNIT, 8800 BBL./DAY (NEW 1952)

TOWERS

8'x5'x85'6" 25 Trays 250 PSI
8'x34'6"x½" 10 Trays
6'x30'x½" 9 Trays
4'6"x30'5"x⅜" 14 Trays
4'x49'6"x⅜" 24 Trays 330 PSI
3'x69'6"x½" Raschig Rings 200 PSI
3'x23'6"x1¼" Catalyst 600 PSI (2)

ETHYL BLENDING PLANT 8500 GAL. COMPLETE SKIMMING POND

VESSELS

6'x40' SOAKER, 500 PSI @ 850° F.
20'x28'4" AGITATOR, cone bottom
10,000 bbl. HORTONSPHERE
6500 gal. PROPANE TANK

50,000#/HR. COCHRANE WATER TREATING AND DEAERATING PLANT

HEAT EXCHANGERS

Sq. Ft.	Type	Tubes	Shell
1080	Reflux	Adm. 125#	Steel 250
993	Reboiler	Steel 600#	" 600
970	"	" 125#	" 250
750	"	" —	—
331	16-138	Adm. 250#	Steel 250
331	16-138	Adm. 125#	" 250
Brown	Fintube	Steel 600#	(11)

110,000 GAL. FOAMITE SYSTEM—COMPLETE

VACUUM CRUDE DISTILLATION UNIT, 15,000 BBL./DAY (NEW 1953)

FURNACE TUBES

500—New Croloy #5, 3" to 6⅝" OD 15' to 32' long
500—4", 4-6% Chrome, headers
200—4½", 4-6% Chrome, headers
200—5", 4-6% Chrome, headers

UPSHOT HEATER COIL TYPE "D" 3" PIPE 600 PSI—417 SQ. FT. GAS FIRED

PUMPS

HOT OIL 334 GPM, 1,000 PSI (2)
FIRE 2500 GPM at 426' head
CENTRIFUGAL from 60 to 1500 gal. from 40' to 655' head
STEAM—Hot Oil—Simplex—Duplex
PROPORTIONING—1 to 5 HP

2-28 SPOT CAR LOADING RACKS, CAPABLE 10 PRODUCTS EACH SPOT

OTHER ITEMS

1000 M CFD COOPER GAS COMPRESSOR
HEAT EXCHANGERS—196-3100 sq. ft. (25)
NEW STEEL STACKS—240'
53—STORAGE TANKS—1,000-100,000 bbl.
40—STORAGE TANKS—1,000-27,000 gal.
10 Ton OVERHEAD TRAVELING CRANE
PIPE—VALVES & FITTINGS—
MACHINE TOOLS—WELDERS—
HYDRAULIC JACKS—HAND TOOLS—
CHEMICALS, ETC.

TELEMATIC 48 TANK GAUGING SYSTEM

Your inspection invited—representatives on premises
Write - Wire - Phone for Complete Information, Catalog

HEAT AND POWER CO., INC.

NEW YORK OFFICE—60 East 42 St., New York 17, N. Y., Murray Hill 7-5280
TULSA OFFICE—310 Thompson Bldg., Tulsa 3, Okla., Diamond 3-4890
DRUMRIGHT OFFICE—P. O. Box 587, Drumright, Okla., Phone 569

FOR SALE

One good used skid mounted Gardner-Denver Compressor, Mod. 425 DD rated 1000 MCF per day at 300# suction—1000# discharge with 145 GK Waukesha. Contact Drew Cornell, Inc., Box 1267, Lafayette, Louisiana.

OR WILL TRADE FOR FOLLOWING:

WANTED

One good used skid mounted Compressor—rating 5,000 MCF per day at 300# suction and 1000# discharge. Contact

DREW CORNELL, INC.
BOX 1267,
LAFAYETTE, LOUISIANA

EQUIPMENT WANTED

11½" or 12" bore x 12" stroke cylinder complete with piston for model SVG-10 Ingersoll-Rand angle type compressor.

CARSON MACHINE AND SUPPLY COMPANY

Oklahoma City, Okla. **Great Bend, Kans.**
Tulsa, Okla. **Garden City, Kans.**

WANTED TO BUY

Shut Down Oil Refineries—
Chemical Plants—Gasoline Plants—
Tank Farms—Pipe Lines, etc.

Specialists in liquidation of oil properties for over 25 years. We have worked with most major Oil Companies in the United States. Will purchase for cash.

Brown-Strauss Corp.
HARRY B. STRAUSS
1546 Guinotte **Kansas City, Mo.**
Telephone HA 1-1000

ROYALTIES

OFFERING CHOICE ROYALTIES. You can now make very small investments on income Royalties or those ahead of drilling. A. S. Berry, 520 Wright Bldg., Tulsa, Okla.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for catalog 57-B. Ross-Martin Co., P. O. Box 900-A, Tulsa, Okla.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

PRODUCTION WANTED

WANTED FOR CASH—Depleted and Marginal Wells for Salvage. Frank J. Black, P. O. Box 150, Phone 107, McPherson, Kansas.

WANT TO BUY—Oil Properties, settled or semi-settled production, 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

PRODUCING oil, gas properties, also royalties wanted. Any size, any amount. Complete details in first letter. Box 231, Scarsdale, N. Y.

WANTED: Oil or gas production, any size, prefer, Okla., N. M., Tex., Colo. or Kan. B. Thurston, 1427 Princeton NE, Albuquerque, N. M.

HAVE DEAL FOR: 20 to 500 barrels settled production, also have Kansas block of 500 acres to farm out, will hold 1/8 override and furnish $1,000.00 dry hole money, can operate same. Lewis Short Explorations, Burrton, Kansas.

OIL PRODUCTION WANTED

For Independent Company interested acquiring Substantial Developed Reserves, if value sound to price, you consider selling—most areas or partial with drilling. Like essentials for preliminary evaluation. Please indicate pertinent data available. Principals write in confidence. PERCY E. A. CONVERSE, Pawnee Rock, Kansas.

SALES AND SERVICE

NEWLY ESTABLISHED West Canadian Sales & Service Company is interested in additional lines or Canadian Representation from U. S. Firms. Write Macro Limited, 10920-88th Avenue, Edmonton, Alberta, Canada.

BUSINESS OPPORTUNITIES

EAST TEXAS ACTIVE, good profits and override being made. References. E. M. Adams, Marshall, Texas.

WE NEED INVESTORS to Assist in Developing 10,000 Acres Choice Oil and Gas Leases, Good Geology Report, Extreme Arbuckle High. Write Saline Basin Petroleum Company; Salina, Kansas.

FINANCIAL CONTACTS. Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817 51st St., Brooklyn, N. Y.

WELL RECORDS

COMPLETION CARDS

For Sale West Texas & Southeastern New Mexico. Complete and filed from January 1, 1948 to present. Estimated 70,000 cards, $3,500.00. This is one half replacement cost.

C. J. CONKLING,
Allen Building, Midland, Texas

SCOUTING

VENEZUELAN OIL SCOUTING AGENCY

Reports—maps—newsletter

Cable: VOSA, Caracas
Mail: Apartado 1961
N. VanMiddlesworth
Phone: 54 48 01

HELP WANTED

PETROLEUM ENGINEER with Master's Degree, or Doctor's in Chemical, Mechanical, or Petroleum Engineering for research and teaching in Petroleum Production Engineering at rapidly growing southwestern institution. Rank and salary open, twelve months employment possible, consulting work encouraged and available in immediate area. Applications will be kept confidential. Box J-902, The Oil and Gas Journal Tulsa, Oklahoma.

HELP WANTED

SALES ENGINEER OR PETROLEUM ENGINEER

interested in sales in South America. Production, gas compression, waterflood, etc. or related experience desirable. Knowledge Spanish desirable but not necessary.

Box K-121, The Oil and Gas Journal, Tulsa, Oklahoma.

SURFACE GEOLOGISTS

(Ages 24 - 38)

Current employment opportunities with a major integrated United States oil company in South America. Openings now exist in an expanding Geological organization at levels requiring from 3 to 8 years of field party experience. Salary, including bonus, from $14,000 to $17,750. Liberal employee benefits and home vacations with travel expenses. Interested experienced Surface Geologists with B.S., M.S., or Ph.D. degrees in Geology are invited to send complete resumes to the address given below. Interviews will be arranged for qualified candidates. All replies strictly confidential.

P. O. BOX 480

NEW YORK 19, NEW YORK

DEPT. A-21

OPPORTUNITIES IN PERU, SOUTH AMERICA with INTERNATIONAL PETROLEUM COMPANY, LTD.

Having recently acquired additional production in this area, we now have attractive positions available for men in the following categories:

Petroleum Engineers **Reservoir Engineers** **Drilling Engineers** **Equipment Engineers** **Gas Plant Engineers**	College degree—should have minimum of two years experience in specific field and total of four years in petroleum industry.
Drilling Foremen **Production Foremen**	Extensive supervisory experience with minimum of 10 years in petroleum.
Geologists **Paleontologists**	College degree, plus minimum of four years experience.
Accountants	College degree, plus minimum four years experience in

Attractive salaries and bonuses, liberal benefit plans and vacations, paid transportation, family housing available. Ideal climate. Age to 45.

WRITE—giving age, education, marital status and complete details of experience. Personal interviews will be arranged with qualified candidates.

Box—308-E, Radio City Station, New York 19, New York.

HELP WANTED

ENGINEERS—Chemical, Mechanical, Petroleum or Gas Engineering graduates. Major Oil Company will interview applicants for openings in natural gas department. Their area of operations consists of Mid-Continent, Louisiana and Gulf Coast. Salary to suit previous experience. Our employees are aware of this ad. Box K-101, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOGRAPH TECHNICIAN fully conversant with recent developments and interpretation, 8-10 years' field practice, wanted to assume responsibilities of supervision and interpretation at headquarters of French oil company in Algiers. Furnish full information on education, experience. Box K-116, The Oil and Gas Journal, Tulsa, Oklahoma.

Operations Engineer

Independent oil company has opening for petroleum engineer with four to seven years experience both technical and administrative for responsible position in planning and control. Knowledge of operating procedures, some valuation work and practical oil and gas law would be desirable. Excellent growth opportunities. Please furnish complete details on qualifications, including starting salary required.

Box J-987,
The Oil and Gas Journal,
Tulsa, Oklahoma.

Refinery Technologist

If you are a chemical engineer with 3 to 5 years experience in refinery process engineering or operation and economic analysis and have an interest in consulting and technical service type work, you should investigate this unique opportunity to capitalize on your background and to participate in the growth of an expanding technical activity of a well-known company allied to the refining industry. This position offers a wide variety of assignments, industry-wide contacts with refining and process companies, for using initiative and originality to increase responsibility. A midwest suburban location offers ideal professional environment. Send resume of qualifications to

Box K-117,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

HELP WANTED

GEOPHYSICISTS

(Ages 26 - 36)

Current employment opportunities with a major integrated United States oil company in South America. We now have openings in our expanding Geological organization for Seismic Interpreters with from 4 to 8 years experience. Salary, depending upon experience and including bonus, from $15,750 to $17,750. Liberal employee benefits and home vacations with travel expenses. Interested experienced Geophysicists with B.S., M.S., or Ph.D. degrees are invited to send complete resumes to the address given below. Interviews will be arranged for qualified candidates. All replies strictly confidential.

P. O. BOX 480
DEPT. A-21
NEW YORK 19, NEW YORK

GULF OIL CORPORATION
—ENGINEERS—

PETROLEUM
GAS
DRILLING

RESERVOIR
MECHANICAL
PIPE LINE

Subsidiary operating in Venezuela has opportunities for engineers with/without experience. Salary commensurate with experience.

P. O. BOX #35
Bowling Green Station, New York 4, New York

PALEONTOLOGISTS

(Ages 30 - 38)

Current employment opportunities with a major integrated United States oil company in South America. An opening now exists in an expanding Geological organization for an experienced Senior Paleontologist with proven supervisory ability and know-how to run commercial laboratory. Salary, including bonus, $18,500. Liberal employee benefits and home vacations with travel expenses. Interested experienced Paleontologists with B.S., M.S., or Ph.D. degrees are invited to send complete resumes to the address given below. Interviews will be arranged for qualified candidates. Replies strictly confidential.

P. O. BOX 480
DEPT. A-21
NEW YORK 19, NEW YORK

PIPELINE
ECONOMIC STUDIES

MAJOR CONSULTING ENGINEERING COMPANY

requires

Management Type Man for Developing Economic and Feasibility Reports on Pipeline Systems.

Address:

Box K-118,
The Oil and Gas Journal,
Tulsa, Oklahoma.

PETROLEUM ENGINEERS

for Reservoir & Production engineering in varied types active fields in COLOMBIA, SOUTH AMERICA. Excellent salary, allowances, opportunity obtain additional experience & advancement. Minimum 2 years exp.

Forward Personal data, college transcript, to:

C. L. LAUE
Colombian Petroleum Co.
375 Lexington Ave., New York 17, N. Y.

HELP WANTED

PETROLEUM & DRILLING ENGINEERS
GEOLOGISTS
PRODUCTION & WELL SERVICE FOREMEN
DISTRICT & DRILLING SUPTS.

VENEZUELA

Expanding operations offer career employment with good salary, living allowance, bonus, low taxes, and liberal benefit program. Reply giving education and experience.

THE ATLANTIC REFINING CO.
P. O. BOX 7258 PHILADELPHIA 1, PA.

MANUFACTURER'S AGENT to represent established manufacturer of Portable Rig Shelters. Prefer agent in Houston with men in New Orleans and Corpus Christi area. Individual representatives in each of the three Gulf Coast areas considered. Reply Box K-102, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs. $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

PROCESS ENGINEER. Modern, growing plant in Gulf South has opening for Process Engineer experienced in catalytic reforming, petrochemicals and economic studies. Furnish record of education, experience, and salary requirements. Write Box J-983, The Oil and Gas Journal, Tulsa, Oklahoma.

ESTABLISHED, well-regarded oilfield equipment manufacturer desire the services of Petroleum or Mechanical Engineer to head product development program. Must have talent for design and ability to conceive and develop new ideas. Major oil company experience desirable. Good opportunity for right man. Salary open. Please give full information. Replies held in strictest confidence. Box K-131, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal, Tulsa, Oklahoma.

Experienced Asphalt Sales Engineer

Must be thoroughly familiar with pricing and specifications and have wide acquaintance. To be located in Mid-Continent area. Good opportunity for right man. State age, experience and starting salary expected. All replies will be kept strictly confidential.

Box K-129,
The Oil and Gas Journal,
Tulsa, Oklahoma.

SITUATIONS WANTED

EXPLORATION ENGINEER familiar with oil resources and concessions available (Middle East countries), seeking position with oil firm. Write Box K-132, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST, B.S. Available now. Experienced subsurface; leasing; completion and production. West Texas and West Central Texas. Married. Age 30. Excellent references. Box K-137, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL ENGINEER: 10 years diversified experience in Production. Exploration, Drilling, and Land Operations in Mid-Continent Area. Desire affiliation with aggressive Producer, domestic or foreign. Box K-103, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Desires connection with company or independent, where use can be made of thorough knowledge of Mississippi and surrounding areas acquired through eight years of major company experience. Box K-126, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, Ph.D., 48. Experienced, geophysical background. Desires position planning and directing petroleum or metal exploration, any where. Now teaching. Box K-128, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 44, Eleven years professional experience in oils and minerals, including 4 years foreign. Experienced in surface (Party Chief) and subsurface petroleum geology and photo analysis. Four years with U. S. Geological Survey with some executive work. Some mining experience. Currently employed. Will accept foreign assignment. Particularly interested in Canada or Alaska. Box K-127, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER: Fifteen years experience process design, economics, project planning and coordination in petroleum and petrochemicals, desires responsible engineering position or technical sales requiring process background. Box K-111, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING SUPERINTENDENT with administrative experience. Employed 20 years in Mexico and South America. Capable of assuming entire responsibility of drilling operations. Desires foreign employment. Box K-106, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—experienced Kansas, Okla., Colo. geology, leasing, deals, drilling, seeks connection independent group desiring representative. Data currently maintained. Box K-120, The Oil and Gas Journal, Tulsa, Oklahoma.

District Superintendent

Twenty years experience in production department of major oil producers, starting as roustabout. Advanced thru pumper, head roustabout, farm boss, drilling foreman, district foreman, and district superintendent. Will consider relocation.

Box K-133, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

OIL COMPANY WANTS TANGIBLES for ten 1,200 foot wells, for an oil payment. Pay-out about 2½ years.

Do not answer unless you are interested in furnishing at least $50,000.00 in equipment for producing wells, for a $100,000.00 oil payment.

New field in cold oil, shallow well area, in Louisiana. Oil is being marketed at better than $3.57 a barrel.

Engineers reports furnished upon request.

SIMCO OIL CO. INC.
P. O. Box 270 Winnfield, Louisiana

SITUATIONS WANTED

PETROLEUM ENGINEER: Age 37, twelve years varied engineering, geological, drilling and production and supervisory major company experience. Desires responsible position in some phase of oil industry. Presently employed. Box K-135, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPT.-Drilling Engr. for large Drilling firm, 11 years prior major oil company experience desires affiliation with aggressive Independent. Registered Petroleum Engineer. West Texas, West Coast or Rocky Mt. area preferred. Box K-136, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

NOW BEING LEASED Forrest City Basin in Iowa. Can I assist you? A. J. Barrett, P. O. Box 122, Siloam Springs, Arkansas.

320 ACRES offset to well that made 400 feet free oil in drillstem test between 1600 and 1700, oil 40 gravity. This acreage donated for well. Box K-123, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL, GAS AND MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

CHAVES COUNTY, N. M.
MAJOR OIL STRUCTURE
MAJOR CO. BLK.; Well to drill PENN, DEVONIAN & ELLENBURGER OIL ZONES. Subsurface & Base Map Indicate Major Field. Royalty & Close In Interests. Data on request to those who Value Great Potential.
W. J. PETERMAN, Geologist
Exploration 1918-1957 Engineering
PORTALES NEW MEXICO

OIL LEASES IN BOOMING

4-Corners Area. November Indian Lease sale brought 30 Million Dollars. Some leases sold for $3,200 per acre. Wells estimated up to 1500 barrels of oil per day. Oil Leases from $2.25 an acre. Fortunes being made. Write for free information now. **ATLAS OIL SURVEY, Dept. OJ-5, Colorado Bldg., Denver 2, Colo.**

NINETY ACRE LEASE

Rig moved in, need financial help, drill Allen sand, around six hundred offset wells pumping. Address

GEORGE HEDGES,
Allen, Okla., Phone 171

LEGAL

Pursuant to the provisions of Chapter 150 of the General and Special Laws of the State of Texas, passed by the 45th Legislature at its Regular Session, as amended by Senate Bill No. 248, passed by the 53rd Legislature at its Regular Session, the Board of Directors of the Agricultural and Mechanical College of Texas hereby offers for sale at public auction in the Office of the Comptroller, Room 202, System Administration Building, College Station, Texas, at 10:00 a.m. Thursday, April 25, 1957, the oil, gas and sulphur lease, on 370 acres in two tracts, the first tract being approximately 320 acres of land located near Rusk in Cherokee County, Texas, and being the same land patented to T. M. Dement on December 11, 1857, said patent being recorded in Volume M, Page 473, Deed Records of Cherokee County, Texas and the second tract being approximately 50 acres of land located near Rusk in Cherokee County, Texas and being a portion of the J. Ainsworth Survey and being the same land conveyed to S. W. T. Lanham by Callie Stovall by deed dated March 26, 1904 and recorded in Volume 31, Page 314 of the Deed Records of Cherokee County, Texas, both tracts of land being under the exclusive control of the Board of Directors of the Agricultural and Mechanical College of Texas, and occupied by the Texas Forest Service. The right is reserved to reject any and all bids. For lease forms and particulars, address Comptroller, Texas Agricultural and Mechanical College System, College Station, Texas.

Atlas Exploration Names Vice President of Sales

Thomas Beard has been appointed vice president in charge of sales for the recently reorganized Atlas Exploration Co., Houston. At the same time, it was announced that the company is discontinuing its activities in the contracting field and will concentrate on construction and sale of gravity meters and gas detectors.

The company soon will distribute a new gravity meter, developed after 8 years of research. This product has been designed especially for oil and mineral exploration. In its line of gas detectors, the company is providing instruments for use in drilling operations and in pipelines, plants, and other areas where excessive gas or other hydrocarbon vapors can constitute a hazard.

Beard formerly was with Houston Technical Laboratories.

J&L Supply Appoints Lindsay Store Manager

Charles D. Brister has been appointed local manager of Jones & Laughlin Supply Division's oil-field supply store in Lindsay, Okla., according to A. G. Bastian, manager of the firm's field sales division, Tulsa.

Brister, formerly a storeman at Oklahoma City, has been with the firm since 1952.

Dow Appointed Leschen General Sales Manager

Gordon N. Dow has been appointed general sales manager of Leschen Wire Rope Division, H. K. Porter Co., Inc., according to Emmett H. Mann, vice president and general manager.

Dow has been successively territory salesman in the Detroit area and sales manager of the Chicago district for Leschen. He will make his headquarters at Leschen's main office in St. Louis.

LEGAL

SEALED BIDS will be received until 2:00 P.M., Mountain Standard Time, April 23, 1957, and opened at that time in the Office of the Uintah and Ouray Indian Agency, Fort Duchesne, Utah, for the leasing of 640 acres more or less, of Allotted Indian lands in thirteen separate parcels, located in Sections 22, 23, 26, and 27, Township 1 South, Range 1 West, Uintah Special Base and Meridian, Uintah and Duchesne Counties, Utah, for oil and gas mining purposes. The details of the lease offering and filing of bids may be obtained by addressing an inquiry to Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah, or to the Regional Oil and Gas Supervisor, U. S. Geological Survey, Casper, Wyoming.

ADVERTISERS IN THIS ISSUE

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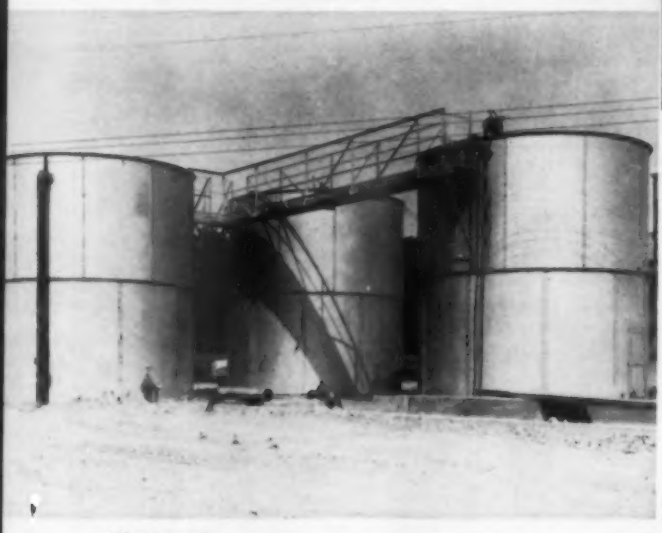
LEGAL

SEALED BIDS will be received until 2:00 P.M., Mountain Standard Time, April 24, 1957 and opened at that time in the Office of the Superintendent, Blackfeet Indian Agency, Browning, Montana, for the leasing of 3,490.91 acres of Tribal land 1,240.00 acres of allotted Indian land located in Townships 32 North, Range 6 West and 36 North, Range 6 West, P.M.M., Glacier County, Montana, for oil and gas leasing purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Blackfeet Indian Agency, at Browning, Montana. R. E. Miles, Acting Superintendent.

STOP and THINK...

ABOUT BOLTED TANKS

Aluminum Sides and Deck, Rezo-Glas Bottom and 2' Side Ring



All Rezo-Glas

All Steel

Bolted steel tanks can be delivered immediately* to your location in standard capacities of:

65 bbl.	300	2,000
100	500	3,000
130	750	3,333
195	1,000	5,000
200	1,500	6,666
250	All made to API Dimensions	10,000

*Delivered immediately means the time necessary to haul to location from any one of 45 correctly located Bolted Steel Tank stocks in the U.S. and Canada. National Supply Corp., our export agents, carry our tanks and parts in several foreign countries, including Venezuela.

Bolted Rezo-Glas** Plastic Tanks or Combination Plastic and Steel and/or Aluminum can be shipped in capacities up to 500 bbl. from our factory in Tulsa, Oklahoma.

Steel is available in painted finish or

HOT-DIPPED GALVANIZED AFTER FABRICATION

(National built the FIRST such tank in 1936)

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TANK COMBINATIONS AVAILABLE ONLY from National include:

1. Painted Bolted Steel Tanks (flat or coned bottom)
2. All GALVANIZED Bolted Steel Tanks (flat or coned bottom)
3. ALUMINUM Deck, GALVANIZED Rings and PLASTIC Bottoms
4. ALUMINUM Deck, GALVANIZED Shell, 2' Lower Rezo-Glas Ring, Rezo-Glas Bottom
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TULSA, OKLAHOMA

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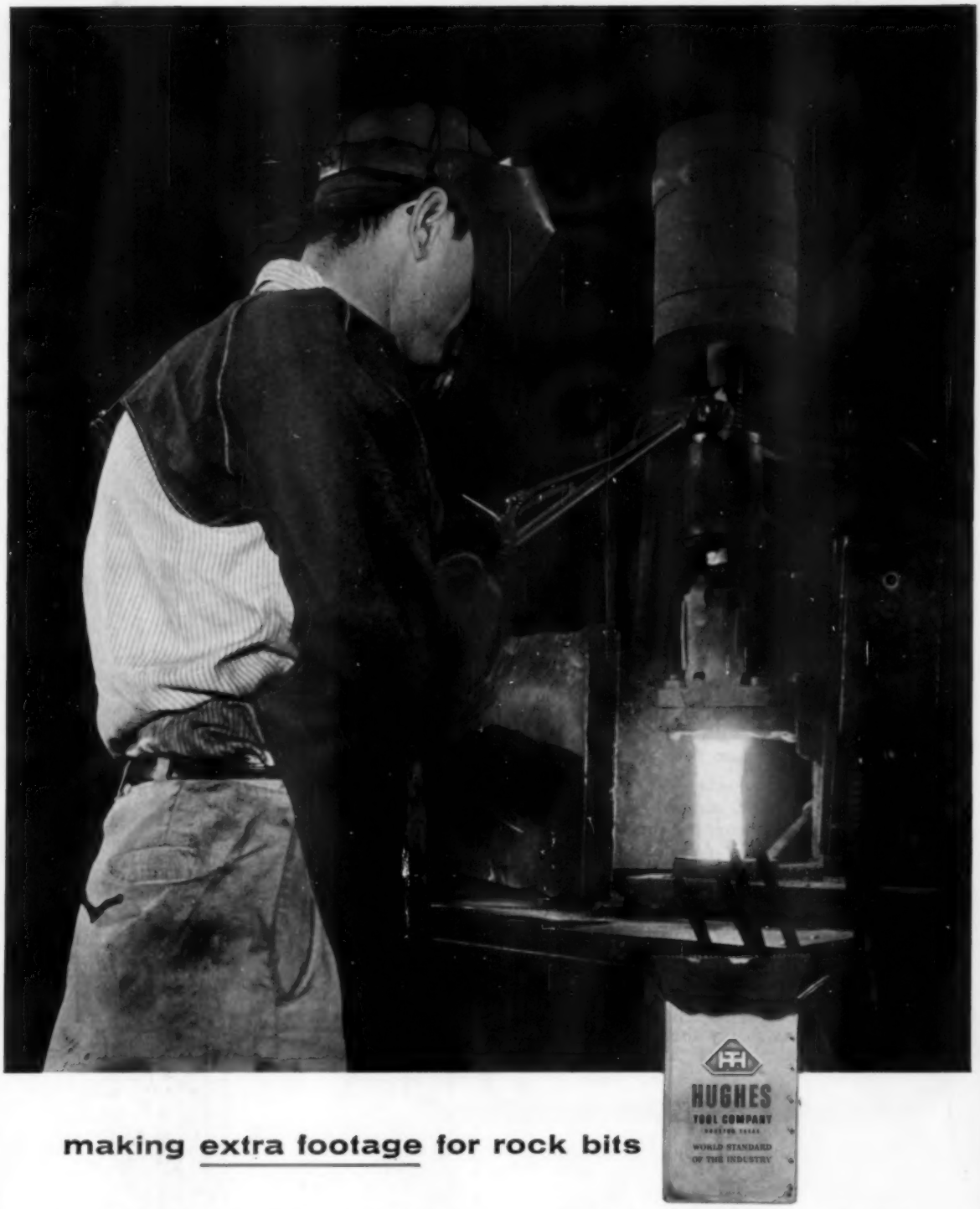

making extra footage for rock bits

The "white hot" metal being alloyed here at over 5000° F., is molten *Hughesite* — one of the hardest known man-made materials. It is 25 times more wear-resistant than hardened steel. *Hughesite* is an exclusive Hughes development. Hughes' methods of applying *Hughesite* to bit teeth and gauge surfaces are increasing the rate of penetration and footage drilled per bit. Here is another example of HUGHES' continuing effort to provide the drilling industry with the best possible tools.